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A SIND LAKE.

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Sind, as viewed on the map and as seen from the sea on approaching Karachi, has a most unpromising appearance; in the former case the Desert of Sind is written, and in the latter an apparently desert of deserts is seen, the few houses of Clifton, surrounded by sand hills, giving a greater aspect of desolation than if no signs of habitation were visible; but along the banks of the Indus which traverses the whole length of Sind are numerous jhils and lakes abounding in wild fowl.

The Manchar Lake, however, though communicating with the Indus, does not owe its existence entirely to that river; it is about 7 miles long and 4 broad; on one side are high barren hills of bare rock, and on the other an open cultivated plain stretching to the Indus, which is distant about 8 or 9 miles.

The lake itself is for the most part shallow and covered with water weed; the water is like crystal, and, looking down on the subaqueous forest through the clear shallow medium, brightened by the usual unclouded sun, it has always reminded me of a most perfect microscopical illumination of some opaque object, a beauty which a microscopist will understand. The surface of the lake teems with waterfowl. Mr. A. O. Hume says with respect to the coots: "I believe they would have to be counted not by thousands, but by tens of thousands. * * * In no part of the world have I ever seen such incredible multitudes of coots as are met with in Sind." This was written in 1873, but since that date Sind has been much opened out, and the Manchar Lake being easily accessible, the number of wild fowl has decreased. On three occasions I have spent about ten days on the lake. Living in a boat is much preferable to camping on the banks for any one to whom a bird is something more than a Hawk, Duck, or Snippet.

As an example of what sights gratify one's eyes in the early morning, it was no uncommon thing to see within a stone's throw of my boat the large and little cormorant, keenly engaged in catching their morning meal, at least two species of tern every now and then descending with a loud splash into the water, the common pied kingfisher hovering over the surface, stilts, one or two of the numerous graceful white herons or egrets, several black-tailed godwits, of course one or two of the numerous harriers which are perpetually sailing over the rushes, and two or three species of the smaller waders; other birds there were, but I think I have quoted enough; within a stone's throw is no exaggeration; no crouching behind a bush, or concealment was necessary on my part; they hardly paid any heed to my presence; on more than one occasion I have seen as many as three white-tailed eagles together almost within gunshot.

One of the methods of shooting wild fowl when required for the pot, and I am afraid often when not, is to be poled towards the numerous duck and shoot at them sitting on the surface of the water at long ranges; it is remarkable how they appear to know the exact range of an ordinary gun, but a choke-bore at present they do not understand; their almost invariable practice is to let you approach within 70 and 80 yards before they take flight.

On the banks are some fishing villages; great numbers of fish are caught by driving them into a net; this operation is accompanied by the most deafening and prolonged noise; if fish can hear, they would hear this; on the front of each boat is a rocking wooden tray in which is a copper dekshi; this tray is perpetually worked, varied with beating the deck with a short stick, the boat itself being rocked; a band conductor, as I will call him, as he seems to regulate the noise and movements, stations himself in a boat at the mouth of the net; it is no uncommon thing for these fishing boats to have a long perch, on which are seated various species of herons and egrets, and cormorants, or else, perhaps, a pelican is standing on their boats. Mr. Murray says that they use these birds as decoys and sew up their eyes; in the case of those I have examined I am glad to say I have never seen this latter cruelty perpetrated.

The natives are adepts at spearing fish, which, when the fish are at some little depth is no easy matter; on account of the refraction, part of the equipment of every boat is two or more spears, and a stone on which to sharpen the points.

I always used to look forward to evening flighting, not only from a sporting point of view, but on account of the bird life which is always to be seen on these occasions; this shooting was always done from a boat concealed more or less amongst the reeds. I will take from my notes an account of an evening's flighting at the end of February last year. "About 4-30, I took up my position amongst the high reeds. The first to come over are one or two stragglers (duck), and then the usual enormous flocks of duck pass by, flying high over head from the direction of the Indus, the first intimation of their approach being the rushing noise caused by their wings; after this, or perhaps a little before, some large flocks of glossy ibis flying slowly in a single undulating line pass close by; one slowly unfolds one of its long legs and leisurely scratches its head, the whole operation appearing very ludicrous; all the time one or two harriers hunt leisurely over reeds ready to pick up any wounded victim to my gun; a gull or two pass over, especially noticeable is the large black-headed *Larus ichthyœtus*, then comes a flock of graceful small white egrets; on one occasion I shot one for identification, which turned out to be *Herodias intermedia*; I also watch with interest the fishing of the blue kingfisher *A. ispida*, and perhaps *A. bengalensis*, and the pied kingfisher *Ceryle rudis*. (I might also have seen the lovely *Halcyon smyrnensis*, but as I am transcribing from my notes on this particular occasion, I did not.) Many wagtails of two or three species flit about the reed-covered surface of the water; the hoarse loud note of the Reed warblers, *Acrocephalus stentorius*, is constantly heard, but although close to me, I can only occasionally catch a glimpse of one amongst the reeds; the little warblers (*Phylloscopus tristis*) flit rapidly in and out amongst the rushes, and if I do not move, they allow me to admire their ceaseless activity almost within an arm's length; as the evening gets on, the croaking of the frogs and chirping of the grasshoppers (?) keep up a perpetual monotonous concert with the splashing and cackling of the noisy purple gallinules; cormorants, both great and small, fly past (in the case of one I shot, the small cormorant was *Graculus javanica*, but in Mr. Murray's *Vertebrates of Sind* I see that both *Graculus sinensis* and *G. javanica* are common Sind species, the former being distinguished from the latter by having *no white thigh or cheek patch*; I did not know of this distinction at the time, so was not on the alert to discriminate between the two species); then I see a few curlews, a flock of crows, and flying close to the surface of the water a

flock of *Hirundiniucæ;* they are gone too quick for identification, but doubtless *Cotyle sinensis;* and then come the duck, but I do not see the cloud of them which last December used to rise from the lake as it were simultaneously, passing overhead in varying numbers, in a quarter of an hour or so the flight is over, darkness has set in, and all is still save the croaking frogs and the chirping insects."

I have mentioned above that *Alcedo ispida* and perhaps *A. bengalensis* are to be seen; but I must confess that I am fairly puzzled with *Alcedo ispida*, *A. bengalensis*, and a small form which Mr. Hume says: " * * compels me to identify it with *ispida* rather than *bengalensis*."—(See Stray Feathers, Vol. I., p. 168.) In no book that I have seen is the difference between *A. bengalensis* and *A. ispida* clearly pointed out. I have four skins of Sind blue kingfishers before me as I write: three seem to me almost the same, except one which is not so long and whose bill is a trifle stouter than the other two; these I refer to *ispida*, but the fourth is much smaller and much brighter; its length is 5·75, bill at top 1·44, bill from gape 1·87, wing 2·65; the bill is blackish brown except at the base of the lower mandible which is beneath reddish; the ground colour of the head is very dark brown; the throat is white and the rest of the under parts ferruginous, but on the breast the ferruginous feathers are tipped with faint light blue; it is male, and was shot at the Manchar Lake on the 15th December 1885.

As regards the geese and duck, on the last occasion I visited the lake (Dec. 9, 1885) geese, duck and other wild fowl were conspicuous by their absence, and I believe throughout Sind; on this occasion I only saw a few grey lag geese (*A. cinereus*), but in February of the same year I have no note of this species, but the barred-head goose (*A. indicus*) was extremely abundant.

The Large Whistling Teal (*Dendrocygna fulva*).—I shot a few in December, but none in February; they are very slow flyers, and when one of their number is shot, they often circle round it, constantly uttering their whistling cry; their feet and tarsus are proportionally very large, and altogether they give any one, who remarks individuality in other than the human species, the idea that they are half-witted.

The Ruddy Sheldrake (*Casarca rutila*), more generally known as the Brahminy, is common; its hoarse croak is often heard as it flies overhead; I cannot agree with the statement in Mr. Murray's Vertebrates of Sind that "they are extremely shy and wary birds," and as

Mr. Reid in Game Birds remarks : " It will not only keep a sharp look-out on its own account, but will fly along the jhil side before the gunner, uttering its warning note and put every bird, on the *qui vive*." I have always found it a slow clumsy bird, easy to approach. I was very amused on one occasion watching a Pariah dog trying to approach one in some deep mud ; the dog with an unconcerned manner, as if Brahminy duck was the one thing in this world which it had the least thought of, the duck as if a dog trying to catch it was an equally distant thought ; the dog at last manœuvred till it was quite close and was evidently heedless of the proverb "First catch your hare before you cook it ;" but then the Brahminy flapped away a few paces ; then the same manœuvres were repeated to the evident amusement of the bird and the annoyance of the dog ; how long the dog would have pursued in this wild goose or more correctly wild duck chase I cannot tell, as I was tired before the dog was ; walking on put a stop to any more manœuvres ; this duck and the former are considered not fit for human food ; a brother officer tried a young Brahminy on one occasion and ate some of it with relish ; he also had a whistling teal cooked ; which he and another friend pronounced good ; I have never eaten the former, but I have attempted to eat a little of the latter ; I shall never do so again.

The Shoveller (*Spatula clypeata*) is very numerous ; as a bird for the table it also has a bad reputation, which, no doubt, is frequently well deserved, as it is a foul feeder and delights in any dirty pool ; but those I tried at the Manchar Lake were not bad eating.

The Mallard (*Anas boschas*).—Last December I think this was almost the most numerous species on the lake ; in February I only shot two in about seven days' shooting.

The Gadwall (*Chaulelasmus streperus*) is also very common.

The Marbled Teal (*Chaulelasmus angustirostris*) very common. When flying, on account of its proportionately large expanse of wings, it appears a much larger bird than it is.

The Pintail (*Dafila acuta*), another very common species.

The Widgeon (*Mareca penelope*), not very common ; I only shot one last December.

Both the Common and Garganey Teal (*Querquedula crecca* and *Q. circia*) are common, especially the latter; none of the males which I shot of the last species during my last December visit had made any attempts to assume the male plumage.

The Red-crested Pochard (*Fuligula rufina*) and the Tufted Duck (*F. cristata*) are fairly common, especially the latter. I did not shoot a single one of either of these ducks last December, nor did I observe any, nor did I see any pochard (*Fuligula ferina*) at that time; I have only a note of it forming part of my bag last February, but whether common or not is not mentioned.

The White-eyed Duck (*Fuligula ferina*) is common.

At the latter end of the season, when the water has fallen, Snipe are common and Jack numerous in favourable places round the edges of the lake.

On the babul-fringed banks of the canal from Sehman I secured a male and a female of *Passer pyrhonotus*; this is an interesting bird from having been rediscovered by Mr. Doig in 1880, not having been recorded in India for forty years previously—see Stray Feathers, Vol. IX.

As regards the other animals inhabiting the lake, which particularly attract notice, amongst the fish there is a fresh-water pipe fish in considerable numbers; in fact, it is almost impossible to look down into the water without seeing several of these gliding in and out amongst the weeds; the natives never seem to catch it; there is also a fresh-water prawn which to the eye uneducated in entomostracan lore appears similar to the well-known marine form. Mr. Murray informs me that it has not as yet been properly identified.

There are several species of fresh-water shells, one,—a fresh-water mussel,—is very numerous; there is another form of large bivalve, which is unknown to me; Limnœa sp. (?) is also very common with a pink variety; Sphœrium sp. (?) fairly numerous; a smallish Planorbis sp. (?) is met with on the weeds, but not in any great numbers; Paludina sp. (?) is very common.

As regards the vegetable kingdom, one of the commonest sights is to see a number of naked women digging up from the mud the roots of the lotus, whose broad leaves cover the water in places, and afford a convenient standing ground for snipe, as I found to my cost, when working the neighbouring snipe ground; these roots seem to be rather highly prized as a vegetable; I tasted them, and they had the flavour of parsnip, but were rather stringy, as they seem chiefly made up of a number of fine silk-like fibres. But for the present I have said more than enough; if I were to write of all I saw at the lake, I am afraid the journal of the B. N. H. S. would scarcely contain it.

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NOTES ON THE WATERS OF WESTERN INDIA.

PART I.—"BRITISH DECCAN AND KHANDESH."

BY A MEMBER OF THE SOCIETY.

The following rough notes on the waters of Western India are written "gryphonibus puerisque," and I do not suppose them to contain much original matter of any scientific value. It is hardly necessary to say that I have drawn freely upon the standard works of Drs. Jerdon, Nicholson, Day and Gunther, but more special acknowledgment is due to later and less known local writers, Mr. Wendon, C.E., Dr. Fairbank, Captain Butler, and other officers who contributed to the *Bombay Gazetteer* and the Reports attached to the Bombay contributions to the Fisheries Exhibition. Even of my own observations, the memoranda used in these notes have mostly been put at the service of the officers who compiled these last-named publications, or used in a lecture delivered before the Royal Asiatic Society. For the Indian angler, Mr. Thomas's "Rod in India" stands by itself; and whoever wants to catch fish in this country ought to read it, and not depend on my incomplete remarks.

As but few Europeans on this side of India are much in the way of sea fishing, I shall begin by describing the fresh waters of the Presidency, which are divided between four very well-marked regions.

The first of these is that of the Deccan and Khandesh. All along the Western Ghats a number of torrents rising very close to their scarped edge flow eastwards; generally, at first, with a good deal of southing. Within a very few miles of their sources these unite to form rivers, the beds of which a good deal resemble those of salmon rivers in Northern Europe; but their streams differ from these in an important particular. Instead of the alternate rise and fall which make European angling a speculative pursuit, we have here three or four months of continual flood, while for the rest of the year each river becomes a chain of pools connected (if at all) by a very insignificant current. Another matter very important to the fish is that this region of torrents and moderate-sized rivers is also one of rice cultivation carried on in small pond-like fields called *kasars*, through which a great deal of the water from the hill sides must pass before it reaches any definite channel. Below the rice region these rivers generally flow through wide valleys for from 50 to 100 miles before reaching the great plain of the Deccan. Their course (as

will have been understood from my comparison of them to salmon rivers) is much diversified with rapids, sometimes even with considerable falls, with gravelly shallows, and with long pools and reaches. These latter occasionally have alluvial banks and muddy bottoms, but more commonly the bank is rocky ; the bed of the same nature, with a good deal of gravel ; and the water clear throughout the fine weather, that is, from October to May inclusive.

There is hardly a single river of importance that is not crossed by at least one ancient or modern irrigation weir ; and on some there are many weirs, all of masonry, sometimes very lofty, and in no case that I know of provided with any sort of a fish-ladder. As many of the tributary torrents as have any stream during the whole or part of the dry season are crossed by many little dams, usually built for the season only, of wattles, mats, and mud or gravel, but sometimes they also are permanent dams of good stonework.

As each group of these rivers debouches from its gradually widening valleys into the great plain of the Deccan, some one of them, like Aaron's Rod, swallows up the others ; and from this point to the eastern boundary of the Presidency its course is generally a huge trough about 100 feet deep and half a mile wide, bottomed alternately with sand and mud, and rarely crossed by a bar of basalt, over which the river falls in rapids or a cataract.

Except at such places the banks are usually of stiff alluvial soil, scarped on the outside of each curve of the stream, where it runs deepest and strongest, but sloping gradually on the inside of the curve to wide sandbanks bordering on the "dead water."

The streams which unite to form the Bhima, most of which rise in the Poona District, illustrate the above description well enough ; but the finest falls on any *large* river easily accessible from Bombay are those on the Godavery at Phultamba.

Before dismissing the Deccan rivers it should be added that each of them after leaving this Presidency is barred by great irrigation works, which completely prevent the ascent of fish from the sea from their lower waters.

Besides its rivers, the Deccan has a considerable number of artificial lakes and ponds, or, as we call them, tanks. Some of these especially those at Khadakwasla, near Poona, and Ekruk, near Sholapur, are of considerable size, and a good many, even of the lesser, are perennial. But the greater number are reduced to mere

puddles, or entirely dried up annually, even in ordinary seasons. Of natural lakes there is not one.

Khandesh, for the purpose of these notes, may be classed with the Deccan, which it resembles in its geology and hydrography; and though its great river, the Tapti, flows into the Arabian Sea instead of the Bay of Bengal, it has only one tributary of importance, (the Púrnă) that does not rise in the Western Ghâts, or in their great spur, the Satmalla Range. Rivers and tanks in these two neighbouring regions resemble each other, even as Fluellen's waters of Macedon and Monmouth. It is true that instead of "salmons in both," "there is salmons in neither;"* and it is now perhaps time to consider what there is instead of salmons.

Nearly all the fishes of any importance belong to two families, namely, the Cyprinidæ, or Carps; and the Siluridæ, or Catfishes.

Probably no writer on Indian fishes, except a professed ichthyologist, can escape from beginning with "the Mahseer." As a matter of fact, although it would not be correct to say that there is no such fish as a mahseer, there is certainly no fish that has an exclusive right to the title, and it is not a genuine native name for any fish in our present province. A certain group of Indian barbels differ from the English representatives of that *genus* in preferring troubled waters and a highly predatory existence. They will eat, indeed, whatever they can come at, from a fly to a wild fig; but what they like best, perhaps, is a little fish, no matter of what sort, even if their own. This frame of mind and palate fits them particularly for the purpose of the sportsman, and wherever you find him in India, he and his native assistants will be found calling some of these predatory barbels "Mahseer" or "Big-head." Even where the term is vernacular, *viz.*, in Hindustan, it varies in local application, and still more in the Peninsula.

Naturalists, however, have generally agreed in appropriating the title to the giant of the tribe, "*Barbus tor*," of whom all that I can say here, unfortunately, is that within our present area he is not at all a common fish; and when found, not often a very large one. The reason is not far to seek. The great rivers of the Himalayas, in which the true "Mahseer" thrives, are fed by rain and melting snow at different seasons to an extent that makes them

* NOTE.—The "Rajputana trout" (*Barilius bola*) and the "Himalayan trout" (*Oreinus*, several species) are not found in this Presidency. Both are Cyprinidæ.

and their upper tributaries perennial. Many of those of the extreme south of India, where also this fish flourishes, get the benefit of two monsoons; and in both cases the upper streamlets run from lofty mountains through, at first, uninhabited jungles of great extent, where spawning fish and descending fry are pretty secure from their worst enemy—man.

The streams of the Deccan, on the other hand, are full for only three or four months, and even at that season the sources of almost every one of them, as far as the barbels are concerned, are, and have been for many generations, in rice-fields, out of which few spanning fish, and not many of their fry, escape alive. All the circumstances are against large fish like *Barbus tor*, with a taste for high spawning grounds, and in favour of species more moderate in size and aspiration, though otherwise of very similar appearance and habits. These are generally known to the natives as "*Kawli Masa*" or "scaly-fish" from their large scales. If I remember right, the allied Burbot has a similar local name on the Rhine. Dr. Fairban gives "*Mhasala*" or "Buffalo-fish" as a Mahratta name for *Barbus tor*, and mentions one as 3½ feet long, one foot *high* (!), and weighing 42 lbs., much the largest I ever heard of in these waters. As regards the value of the whole group for the table, all I can say is that I never tasted a Mahseer of any one else's killing that was worth putting a fork to. What I kill myself are (of course) good fish all round. They will all sometimes rise at a fly or a spinning bait (dead or artificial), but live bait is certainly the most killing. The name of "Indian salmon" is an absurd misnomer for these or any other Indian fishes; a Mahseer no more resembles a salmon than a Buccaneer might an English naval officer.

Next after the Mahseers come the Labeos, or *Rahu* or *Roho* fish, named by Hindu fancy after the mythical dragon who causes eclipses by swallowing the sun. The type of the *genus*, perhaps, is Labeo Rohita, the "*Roho* fish" proper, called in Mahratta "*tambada masa*" or "copper fish." The name "*Roho*" is as much knocked about as that of Mahseer. These Labeos are easily distinguished at the first glance from the Indian barbels by their longer form and very peculiar mouth, set under the snout, and furnished with thick warty lips, convenient for grazing from above on water weeds, which, with perhaps some insects and snails, form "the chief of their diet." They like still and muddy water; in this resembling the European

carp; and I should certainly have called them "Indian carp" in this paper if Mr. Thomas had not most unfortunately appropriated the title to an omnivorous fighting barbel closely allied to the Mahseer and actually called Mahseer by Europeans in our province. *Factum valet quod fieri non debuit*, the Rohos must go without an English name. In net-fishing throughout our province they are usually the largest fish in the net, but are very apt to escape by jumping over it in fine style. I have more than once seen one knock a man down and go off over his prostrate body, and have got good sport by wading behind the net with a spear and striking them in the air. The best baits for them are paste, earth-nuts and gram. Worms are so scarce in this country that one can hardly count them among available bait, but when you *can* get them, hardly any Indian fish will refuse them. If any gentleman despises bottom fishing, let him try for a Roho with fine tackle (coarse tackle is of no use) and if he hooks one, he will find the play much more like that of a salmon than a Mahseer's; and the fish, moreover, very much better for the table. With a little trouble they can be kept alive for a good while, and even when dead do not quickly become stale.*

After the Mahseers and Rohos there are no Cyprinidæ of any account either for sport or for the table, though several small sorts, such as Chela, Rasbora, and Barilius, can be taken with a midge-fly or small bait and trout rod, and fried in rows upon a bamboo splinter, after the fashion known to mofussil house-keepers as "Havildars and twelves." If small enough, they can then be eaten bones and all, and are no bad variety in the monotonous bill of fare of a camp.

The next family, the Siluridæ or catfishes, though not so numerous in individuals, are quite as often "in evidence," as several of them are much better eating than any Indian Cyprinoid. They are all scaleless, and most of them have a "dead fin" behind the great back fin like a salmon or trout. The commonest and best for the table is the "*Padi*" or "*Shiwara masa*" (*Wallago attu*), the Boalli of Upper India. Dr. Fairband gives "*Padi*" as a name for *Silundia Sykesi*, another catfish, much handsomer, and possessing a dead fin, for which Sykes himself gives "*Pari*" and "*Sillun*." *Wallago attu* grows to a great size, bites well, and shows good fight. On one occasion I had played one almost within reach of the landing net, when a second of about

* NOTE.—Shah Jahan or his father, I forget which, gave a horse and a village to a lucky angler who brought him a fine "Rahu machi." The story is in Elliot: *auctore Imperatore ipso.*

equal size rushed up, laid hold of the captive, and carried him off into deep water, where, after a few minutes, the fine tackle gave way.

The terms *Singhala*, *Singhatta*, *&c.*, signifying, "Horn-fish," are applied by Mahrattas to several catfish with long feelers, mostly of the genus Macrones. These generally give fair sport, and are good eating. The best way of angling for any of them is to use a live bait in the evening, when they leave the deep water, and maraud along the banks, or near the surface. Failing such bait, fresh raw meat answers fairly well. It is good to shoot some wild bird or kill a chicken beside the river bank, and bait with warm flesh, as all carnivorous fish are strongly attracted by the smell of blood.

In handling the catfishes it is necessary to be very careful, as several species are provided with formidable spines, to say nothing of numerous and sharp teeth; and the wound of either is apt to be very painful, and takes long to heal.

The larger species are sometimes known to sportsmen as "Fresh-water sharks" from their size, temper, and well-furnished jaws.

After these there is only one family of sporting fish left to name, *viz.*, the walking fishes or *Ophiocephalidæ* (snake-heads), commonly called "*Murrell*." These are long fish, something of the shape of a ling, whose head is fancifully supposed to resemble that of a snake, whence the scientific name.

The Murrells are known to natives in the Deccan by that name, but elsewhere in this Presidency as *Dhak*, *Dhakru*, or *Dhok*. They are chiefly remarkable as air-breathig fish, a quality which enables them to live for many hours out of water, and even to move for some distance over land, wriggling and crawling with their flapper-like fins, whence their English name. They cannot, indeed, live altogether under water, but must rise to the surface occasionally to take in fresh air; and they like to lie at the top with their nostrils exposed and breathe air for long periods together. To do so in the centre of a stream or tank would expose them to many enemies; and the Murrells accordingly lurk in thick beds of weeds, or under overhanging roots or rocks on the bank, where they lie half erect in the water, breathing air and looking out for wind-falls. They are said to have subaquous burrows, but these, in the nature of things, they cannot use for any long time together, and in my opinion they pass most of their lives at the surface, but so skilfully concealed that they are seldom observed.

In such a position they can sometimes be caught by dropping a frog, grasshopper, or the like, upon the water close to them; but this is usually very difficult to do without being seen by the fish. At night they leave their lurking places and cruise for prey near the surface, and then they are often caught with trimmers baited with live fish or frogs, or in favourable places with the rod, using for bait the smallest possible fish, frog, tad-pole or even fresh raw meat. I once caught over two dozen of a small species with the rod in one evening with the latter bait. The Murrells are said to be monogamous, and, in fact, patterns of domestic virtue until their young come of age, when the parents turn them out to seek their fortune; and *eat the laggards*. All of them are good eating when in season, but at other times muddy flavoured. The same is the case with the catfishes, and this is usually accounted for by the difference of waters. My own experience is, however, that these fishes, like salmon, are often good eating even when taken from still and muddy waters, and earthy flavoured in the clearest streams. I have no doubt that it is with them, as with the salmon, a question of season.

In some rivers considerable numbers of Murrels are shot as they rise to the surface, with bullets or with barbed arrows. The arrow-heads are loosely set, but connected with the shaft by a line wound round it. The archer plunges into the water, recovers the floating arrow-shaft, and hauls in the fish by the line. The mere shock of the bullet on the water will often stun a fish without actual contact.

The last thing to be said about these interesting fish is that they have the power of lying asleep in the mud of dried-up tanks until the return of the rains,—a power shared by several other fish of this region, especially by a queer-looking creature, called "*Wambh*," "*chalát*," and "*chambare*" ("tanner-fish"), *Notopterus kapirat*.

True eels (*Ahir*) are not very often caught in the Deccan, partly because they are really not common, but still more because the fishing gear of that country is unsuited for their capture. I only once saw one caught, *viz.*, at Phultamba, on the Godavery, a famous neighbourhood for fish. My Portuguese cook refused to cook it on the ground that it was "all same like ishnake." There is only one species, *Anguilla bengalensis*, which grows to at least 5 lbs. weight.

No prejudice attaches, however, to the spiny eels, called commonly "*Bham*" and "*Wambhat*," strange-looking fishes with rows of prickles and long "trunk-like" snouts. They are very good eating, but of no importance from a sporting point of view, though I have seen my servants catch them on hooks baited with raw meat.

Beside the lesser Cyprinidæ mentioned above several fresh-water herrings will take a trout-fly, giving a good deal of amusement in a small way, and these are all good for the table in the form of "Havildars and twelves." Along with these is sometimes caught the queer-looking fresh-water garfish (*Belone cancila*), called in Mahratti "*kutra*" or "dog-fish," probably from its greediness, or from its long well-armed jaws. It is exactly like the garfish of European seas, living mostly close to the surface, and very fond of skipping over any floating stick or straw. In our present province both game and meat are often very scarce, and after many days' diet of tough mutton and tougher "moorghies" in a bad climate, a very moderate dish of eatable fish is a welcome luxury.

Setting aside nets and traps, it may be said that the main points for the angler to remember in such waters as I have been describing are to use a trout-rod for small fish, a salmon-rod for the large ones, the finest line he dares, and the smallest hooks on the strongest gut that he can get. Even in spinning he should never use treble hooks because almost all the fish he looks out for, except some catfishes, have small mouths; and the mahseers, though they have no teeth in their mouths at all, have such power of jaw that they can break anything that offers resistance, as a treble hook does. If further information is required, the best of it is to be got in Lieutenant Beavan's "Freshwater Fishes of India" and Mr. Thomas's "Rod in India."

I repent that I have omitted to notice one handsome genus of carps, the *Cirrhinas*, which are very good eating, and would probably, if one could get them to take either a fly or bait, give better sport than any other Indian fish, as they have certainly no equals in grace of form and motion.

Although the fishes have claimed precedence in remarks upon their own element, their possession of it is disputed by many other creatures. In our present province, excluding man, only one of these is a mammal, *viz.*, the Otter (*Lutra nair*), called in Mahratti "*Ud*," "*Lad*," and "*Pan-Manjar*" (*i.e.*, "Watercat"). I once heard a Kashmiri Pandit call one "*Ludra*," which comes close as can be

expected to the Latin and Greek. This animal is far more common in the neighbourhood of the ghats than is supposed by most sportsmen; but being very shy, and of nocturnal habits, is rarely seen. If, however, one follows up any river near Poona, for instance, in the early morning, one is pretty sure to come on his unmistakeable "seal" on a mud bank, and very likely on the remains of his supper. The otter of the Deccan is much smaller than in Upper India and Sind, though classed as the same species.

Aquatic birds are more numerous. I have never seen any of the fishing eagles in the Deccan,* but the Osprey is not very uncommon, and the chestnut and white "Brahminy Kite" does a little fishing. He cannot go under water like the Osprey, but picks up small fish from the surface. The fishing owls (Ketupa) are very rare here, being essentially forest birds. Specimens of two species were sent from this Presidency to the Fisheries Exhibition, but it is not stated whence they came. Of Kingfishers, 5 species are found, as follows:—

(1) The large Blue Kingfisher, *H. Leucocephalus*;
(2) The Lesser Blue Kingfisher, *H. Smyrnensis*;
(3) The Least Blue Kingfisher, *Alcedo bengalensis;* and the
(4) Pied Kingfisher, *Ceryle rudis.*

The two last are the commonest, especially in the open plains; the others prefer wooded streams, and vary their fish diet a good deal with grasshoppers and the like. *Halcyon smyrnensis*, indeed, seems almost independent of water, wherever there is woodland. The Pied Kingfisher is the most conspicuous and best known from its habit of hovering over open water and dropping like a stone upon its quarry. I heard on good authority of its attacking in this manner a dog that had passed too near its nest in a bank.

(5) Colonel Sykes records the rare and beautiful Three-toed Purple Kingfisher (*Ceyx tridactyla*) from this region. The whole tribe are known to Mahrattas as "*Dis*" and "*Kilkila.*" They generally build in holes; but once in Sind I found *Alcedo bengalensis* breeding in a very rude pendulous nest in the grassy over hanging bank of a canal. The young were destroyed by a flood. I fancy that this Kingfisher was not the original architect of the nest.

* The white-tailed sea-eagle (*Poliatus ichthyætus*) is recorded from Dharwar.

The common and Demoiselle cranes do not touch fish or spawn, and the large Saras crane, which is accused of doing so, is very rare in the Deccan and Khandesh. It is not likely that any Plover can interfere much with fish or spawn, though I once saw a common "Did ye do it" (*Lobivanellus goensis*) catch and eat a small fish. It is, indeed, the only Plover which haunts the waters of our present province in important numbers. *Esacus recurvirostris*, the great Stoneplover, is found here and there in the beds of large rivers, and perhaps may eat spawn, or even fry occasionally, but its main dependence is on insects and crustacea, with a few shellfish.

Of the *Longirostres*, the snipes and their allies, we have, though in no great numbers; the "full" snipe, "painted Jack," and "pin-tail" snipe; the greenshank, several sandpipers, and stints; curlews and whimbrels (both rare) and the stilt (*Himantopus candidus*). This bird and its tribe would probably devour fish and spawn, but I do not know of any positive evidence against them; and most of them can plead *alibi* here, being cold-weather visitors only. The stilt and greenshank, though not very sporting birds, are very good for the table.

The coots, waterhens and rails are chiefly represented here by the bald coot, the European waterhen, and the white-breasted waterhen, *Gallinula phœnicura*. The second of these is much accused in England of eating fish spawn; the first nowhere, I think, and the last seldom enters the water of its own accord, though usually living near it. It is, in fact, a bird rather of the bank than of the river, and I have shot one 20 miles from any bigger water than a well. All three breed within this region.

The next tribe, however, the *Cultirostres*: Storks, Ibises and Herons are mostly very much dependent on the water. Their chief, the Adjutant, can, indeed, do well enough without it. He is rare in the Deccan, much less so in Khandesh, but he fishes rarely or not at all. The fine black-necked stork (*Mycteria australis*) is rare, and so are the black and the white stork (*Ciconia nigra* and *alba*), both of which are northern birds that hardly get so far south as the Deccan, even in the cold weather. Even the name of the former is here appropriated by the resident white-necked stork (*Ciconia leucocephala*), which breeds here in trees in the rains, and is very common, foraging both on land and water, but chiefly on the edge of the latter. It eats plenty of fish, still more frogs,

crabs, and tadpoles, lizards, grasshoppers, and, it is said, sometimes snakes, and even field mice.

This fowl of a mixed diet is sometimes eaten himself by the lord of creation, under the name of "beefsteak bird" for a change. So is his frequent neighbour, the Pelican ibis, (*Tantalus leucocephalus*), who lives in much the same way and in the same places, and is not uncommon here. The white ibis is found on the larger rivers, often along with its relative, the spoonbill; neither is common, and neither can eat many fish, though they probably do not spare spawn when they find it. Both are eatable, though coarse in flavour. The shell ibis is almost unknown; the glossy brown ibis rare; and the red-headed black ibis has hardly the habits of a water bird at all. I regret to say that upon slight temptation he becomes a mere scavenger; but in places where he cannot get at dirt, he is, though coarse, quite eatable.

These ibises have intruded themselves wrongfully between the storks and the herons, which are numerically exceedingly abundant. Up to the present we have had to deal with no creature, except the osprey and kingfishers, which can be called a mere enemy of the fish. For the otters and the piscivorous birds mentioned above (with the exceptions given) destroy more frogs, water insects and crustacea than they do fish, and all these are deadly enemies of fish spawn and young fry.

The herons, however, and most of the birds remaining for notice, subsist almost entirely on fish.

The common grey European heron is found on all the rivers and tanks, and requires no special notice. The great Malayan herons, *A. Goliath* and *A. Sumatrana*, are not, I think, found in this Presidency, though Sir A. Burnes figured something like *A. Sumatrana* from Sind. A bird somewhat allied to it, the purple or grass heron, is found on a few weedy tanks in the Deccan, but is not common; nor is the queer-looking night heron, which, though its nocturnal habits keep it a good deal out of sight, generally lets one know of its whereabouts by its peculiar and often repeated cry.

The egrets are numerous, and first amongst them is the great egret (*Herodias alba*), valuable for the long feathers of its back. These are at their best in the early breeding season—May, June and July. Their growth coincides with the change of the beak from yellow to black: and the plume hunter should therefore not waste his shot on an

egret with a *yellow* bill. The same is the case with the lesser white egret, whose plumes, though, of course, smaller, are still worth having.

The cattle egret, with his buff plumes, can hardly be counted a water-bird, and the bittern is rare; but the little paddy bird is really one of the "features of the landscape" all over India. You find him on every stream and pond picking up fish, tadpoles, crabs and what not, and occasionally swimming, or rather floating. He does not, as far as I am aware, ever *fish* beyond his depth. The sudden change of this little heron from a grey bird to a white as he flies off is a real transformation; and his moult from grey to purple and white is quite a hard thing to get young naturalists to believe in. The bittern is rare in our present province; and it would take up too much time to go further into the history of the smaller herons, with which, indeed, this is not a favourite region.

Of the great tribe of ducks and geese there are hardly any that will not eat fish spawn whenever they can get it, and few that do not occasionally pick up small fish, but the latter are not the principal food of any found here, and during the rains, which are the great spawning season of the fish, you might go all through the Deccan and Khandesh without seeing a single duck or teal of any description, unless on some remote tanks which are favoured by the *nukta*, or black and white goose, with its queer bottle-nose, its duodecimo-edition, the cotton teal, and the bay-coloured lesser whistling teal. Dr. Fairbank and myself have observed the larger whistling teal in the Ahmednagar District, but I think it is only a cold-weather visitor there, and it is certainly very rare. It does, like the three above-mentioned, breed in other parts of India. The whole four are very poor eating in the cold weather, when the migrant ducks are most numerous and in best condition; but they improve much in flavour in April and May, just when the northern visitors are not to be had. This is easy enough to understand if we consider that the northern waterfowl begin to breed in late spring or early summer, and have got through the trouble of raising their families in July and August. From that time till the next spring they think of nothing but filling their stomachs, and though they fall off a little in condition during their long flight across the mountain barriers of India, they soon recover it. The few snipe, for instance, that remain here till April, which are celibate fowls with digestions unimpaired by any

affection of the heart, get to be mere balls of fat, and a tailor might knock them down with his goose. Contrariwise, the late snipe in the British Isles, birds with such strong family affections that they marry on the spot instead of going to Norway and Russia to do it, are almost unwholesome.

To return to our Indian ducks. These mostly breed from July or August, and at Christmas they have hardly yet recovered from their domestic exertions. But by April and May they have fully regained condition, and the young birds have acquired their full size, or nearly. The first in rank of the migrant ducks is that very eccentric bird, the flamingo. It is likely enough that some readers may be surprised at my calling it a duck at all. However, if any gentleman in that frame of mind will shoot a flamingo, and then compare its feet and the inside of its bill with those of the nearest duck, he will probably begin to admit that there is some reason for doing so. If the experiment is followed up by keeping it fifty or sixty hours in its feathers, plucking it, and roasting it, he will probably become a convert. Skinned birds, and especially birds kept after skinning, taste very different from those simply plucked. A skinned teal, for instance, is quite unrecognizable.

Our cooks have an execrable habit of plucking birds many hours before they cook them, which is fatal to all flavour, the victims get dried up to leather. Game, and even poultry, should be drawn as soon as possible after death, but in hot climates the feathers should not come off till the last moment. They prevent evaporation and keep off insects. Of course, all this does not apply to game of which the skins are to be saved as specimens. The sooner the skin is off, the better for this purpose; but then the carcases had better be used up in soup except with a few coarse birds eaten only for want of better, as "a change on the everlasting mutton and moorghie." Of these are the bald coot, the Brahminy duck and the "beefsteak birds" and ibises (commonly called curlews). Sand grouse ought to be *kept in their skins*, but skinned just before cooking.

To return to our flamingo, he is only found in our present province on a few large tanks and rivers, and does not breed here. It seems to be very uncertain when he *does* breed, but the first flocks fly southerly on the Indus in September, like those of other migrant ducks. The flamingo rarely swims, but will sometimes do so on a tank or river rather than take the trouble of flying from one sand-

bank to another. On one occasion I shot two of a flock which lit and swam in three fathoms of salt (and rather rough) water on one of the creeks of Bombay harbour. This was on the 28th May, very late for a migrant bird. They are said to run sometimes, but I never saw even a winged flamingo so far forget his dignity. It is probably known to most of my readers that flamingoes shovel up their food with the *upper* mandible, turning the head quite upside down, in the position of the Gordian acrobat, "with his grisly head appearing in the centre of his thighs." I have seen drawings of a variation of the bill of the domestic duck, produced by cultivation and selection, exactly like that of the flamingo. The breed was said to be German, but how these ducks fed was not recorded by my authority. A flock of flamingoes in flight, with the sunlight on their red and white plumage, is a lovely sight. They usually fly in a rather irregular wavering line, the centre birds much higher than the flankers; and I have heard a flock likened to "a drunken rainbow." The native names are *Rájháns* (or king-goose) and *Rohi*. The latter is so like the name of the Nilgai in Mahratta that I once supposed myself to be going in pursuit of the "blue bull," when my guide was really taking me to a flock of flamingoes.

Real wild geese do not come into the Deccan or Khandesh, as far as I am aware. The "black-backed goose," "comb-duck" or "*nukta*" (*Sarkidiornis melanonotus*) is found more or less (generally less) over the whole region; but many people consider him rather a duck, and his habits on the water *are* those of a duck, though his flight is that of a goose. This bird may be considered the representative here of the South American Muscovy ducks, which essentially tropical birds have got their Hyperborean name by reason of a funny confusion between "Musk" and Muscovy. They are supposed at certain seasons to have a flavour of musk. The only other bird of these waters having any pretence to goosehood is the well-known ruddy shelldrake called "Brahminy duck" and "Brahminy goose," and by natives all over India "*chakwa-chakwi*." It really has much of the build and flight of a goose, and seems to me to lead to the true geese from the shelldrakes, as the "*nukta*" does from the ducks. Particularly it has a goose's habit of grazing on young grass or corn, and this makes me very unwilling to accept Mr. Hume's charge against it of eating carrion. This idea may have arisen from a mistake between this bird and the similarly coloured Brahminy

kite (*Haliastur indus*) caused by the mirage which hangs over the sandbanks that they both haunt. I have myself carefully stalked what I took for a Brahminy duck in the bed of the Tapti, to find, when within range, that I had wasted my pains on that "greedy gled." If, however, a carcase of any animal were lying half in the water, it would attract the crustacea, to which no duck objects. I do not know any season at which this bird is anything but a last resource for the pot, but it is sometimes shot for the sake of its very handsome plumage.

Of the true ducks, the European mallard (*Anas boschas*) is not, to the best of my belief, found in the Deccan or Khandesh at all. When any sportsman of those parts tells you he has killed so many "mallards," he generally means the closely allied spot-billed duck which is found here, with the shoveller, gadwall, and pin-tailed ducks and the white-eyed duck (*Aythya nyroca*), which would be far better named the white-*winged* duck from its white speculum, the colour of the eye being very far from constant. It is small, and not usually considered a first-rate duck for the table, but this depends a good deal upon its diet, which is, I think, a little miscellaneous. I have heard single specimens highly praised by competent epicures. This bird, the shoveller, and the blue-winged teal are perhaps the commonest ducks of the region, and certainly make the longest visit. The common or grey teal of Europe is also well known here, but on the whole the country is a bad one for ducks. The mergansers and the true shelldrake are not found here at all.

Of the next tribe, the grebes, we have one, very common, the dabchicks, probably identical with the European bird, though some naturalists separate it. At any rate it is similar in appearance and habits. The Mahrattas call it "*Pan-buddi*" or "water-diver." It is a great enemy of fry and spawn ; useless for any human purpose ; but it gives life, often enough, to waters that show no other swimming bird. It is sometimes shot as a "teal," a mistake which could not, I should think, survive the first mouthful, but I have not tried. It is a permanent resident, and breeds in some quiet places.

On large rivers and tanks one occasionally sees the brown-headed gull, and daily some species of fresh-water terns, very beautiful and graceful. These eat an enormous quantity of small fish and crustacea, and moreover forage ashore, chiefly for grasshoppers. I have not found the nests of any of them in this region, although one might

well expect them to breed on the sandbanks of the larger rivers. The strange black and white skimmer (*Rhynchops albicollis*), which looks something like a tern, is not, I think, found here, though it does exist on the lower waters of our rivers beyond our boundary.

Only one tribe of birds remains to notice—the fishing birds proper, headed by the pelican. I have once seen the great white pelican of Europe in Khandesh, and the Indian grey pelican is occasionally met with all over the region, and may breed in it. The smaller white pelican may be found, but I do not know of any record of it here. Pelicans, indeed, want more fish and bigger fish than they can often find in our present waters. Even their lesser kindred, the European and Chinese cormorants, are not common, probably for the same reason, but another poor relation, the little cormorant, *Pelicanus javanicus* is everywhere. There is hardly so small a puddle that you will not find one or two of these amusing birds on it, and on very moderate-sized pools a flock will alight and worry the water in all directions till every fish, crab, and prawn is either eaten or driven into cover. They have favourite roosting places to which they fly from a long distance, and about sunset the flocks follow each other rapidly, always following the course of the water. They are bold and familiar birds, and will come and fish in front of a tent for hours, and sometimes attach themselves to buffaloes in the water, as cattle-egrets do. A solitary buffalo, which used to spend its day in the water near my tents, was attended by, apparently, a particular cormorant, who would dive off on one side and come up on the other passing even between the fore or hind legs, and then spreading, his wings to dry as he perched the buffalo's head or back; the latter did not seem to object at all. Probably his body attracted small fish, of which some species are very curious, and will come bobbing their noses against any new object, to the great discomfort of nervous or thin-skinned bathers. It is just possible that they know enough about a buffalo to calculate on finding ticks on him, but this is a mere conjecture. The little cormorant is much given to perching on trees. Even the larger European cormorant does so more freely here than in Europe, confirming the statement in Paradise Lost—

> "Upward he flew, and like a cormorant,
> Perched on the tree of life."

Milton can hardly have had many opportunities of observing cormorants; and I have even known the passage to be criti-

cised by English observers as untrue to the habits of the bird, but the poet was right. The Mahrattas call the cormorants "*Pan-kawala*," or water-crow—a very good name. This bird breeds in trees, and no doubt sometimes within our region. But I have not got the nest here, and I have noticed that cormorants are scarce in the Deccan in the rains, when the muddy and violent currents are unfavourable to their fishing. I think it likely that most of them migrate to breed; probably to the lowlands of the East Coast. I did once know a man who declared that cormorant soup was very good, but I can't say I have tried it. My friend's pot was supplied with meat of *Pelecanus carbo*, but probably all species of the genus would have much the same flavour, and that a strong one. It would be a good thing if any use could be made of *P. javanicus*, for the ravenous little bird probably diverts more fish from the human dinner table that any other bird or beast except the paddy-bird; and these two together, I think, eat more fish by tale, in this region, than all other bipeds and quadrupeds put together.

The next bird (and the last on my list) can do more as an individual, but he is not nearly so common. This is the "snake-bird" or "darter" (*Plotus melanogaster*), a "cormorant with a heron's head and neck."

This bird may be found on all the deeper streams, but in this part of India not so often on tanks, probably only because the Deccan tanks very often offer no good perching places, or are too much disturbed by men and cattle, for elsewhere the snake-bird is as apt to be found on a tank as on a river. He delights particularly in wooded streams and in trees that overhang deep water, but I have never seen him plunge from such a position to catch fish like a king-fisher, as an American species is said to do, whence the name "darter." Nor does he fish from the wing, but entirely by diving like a cormorant. His flight, however, is much more lofty, powerful and graceful than that of any cormorant; and he frequently soars for a considerable distance without apparent motion of the wing, which the larger cormorants can do only to a very limited extent, and the little cormorant not at all. I have never got the nest of this bird, and I doubt his breeding in the Deccan or Khandesh. If he does so, it is probably in the hills, but, as with cormorants, the diminished number of "snake-birds" in the rains makes me think that they emigrate to breed perhaps to the "Bengal side

of the punkah," where Dr. Jerdon found them most plentiful. They are much hunted for the beautiful black and white scapular plumes, which have their edges as it were "Italian-ironed." There is no prettier plume for a hat than the bunch from one wing of a snake-bird, with a few white egret feathers set behind it and rising above it. The season for shooting the birds is in the cold weather; some of them begin to moult in April, and by May not one of them has a feather fit to be seen. The moult is often so complete that the bird altogether loses the power of flight, and must remain on a favourite pool for some days. Like all the tribe, it can scarcely move at all on land. It is generally easy to see before firing whether a bird is in good plumage or not. If it is sitting out of the water, or flying, the silvery plumes and similar coloration of the wing are pretty visible, and when it is in the water, showing only the neck and head, or flying overhead, the neck tells an old plume-hunter whether he should spend his shot. In good specimens the neck looks almost white; in moulting birds it is much darker.

It is a mistake to shoot a snake-bird sitting, as the plumes are likely to be damaged by shot. He should be taken in the water, when he shows only the head and neck, or on the wing from below. In the former case small shot should be used, as the thin neck forms a very narrow target.

Of fresh-water reptiles we have in the Deccan region, first of all, certain water tortoises or terrapins, easily distinguished from land tortoises by their webbed feet, and from the fresh-water turtles by their "tortoise-shell" back and breast-plates, and by having either five or four visible claws on the fore feet and always four on the hind feet. Curiously enough, while the American terrapins are of most delicate flavour, ours are uneatable, smelling foully, as is indicated by their untranslatable Mahratta name. They are carnivorous, and are sometimes caught on a live bait, or on a worm, or bit of raw meat. Some that I kept in confinement refused carrion. The natives often put them in wells, especially *Emys trijuga*, the commonest species, and call them, as well as all other tortoises, and turtles, "*Kasaw*." All "Kasaws" are supposed to be poor relations of the great turtle, who upholds the world, and are accordingly respected by the more pious Hindus, and an image of a tortoise is often to be seen on the floor of a temple. This has something to say to the putting of them in the wells, but they are useful there as scavengers, and as mortal enemies of the fresh-water crabs (*Telphusidæ*), which

do a great deal of harm to wells by burrowing in the foundations. They cannot, I think, do much in the way of catching live fish, for I have known them to be in wells with fish for many months without any diminution in the number of the latter, though there was apparently no other food. Probably frogs, crabs, mollusca, and insects form their chief diet; and it may be, as I shall show reason for believing with regard to the next group, that they have been too hastily pronounced "exclusively carnivorous."

This next group is that of fresh-water turtles.

These are, compared to the terrapins, very flat and round, with a distinct edge, something the shape of two saucers put "lip to lip." They don't show any "tortoise-shell" at all, but a smooth leathery surface, flexible round the edges. In front and behind, this flexible edge is double, and obeys the voluntary action of the muscles, at least in young specimens, which, after drawing their heads within the shell, will close the edges of the upper and lower leathery flaps till they almost touch each other. These fresh-water turtles have all been classed as carnivorous, though Dr. Kelaart long ago recorded that one (*Emyda ceylonensis*) in his possession fed freely on bread and boiled rice. I have repeatedly myself taken wild specimens with paste baits, and have seen them assemble under a wild fig tree (*Ficus glomerata*, the *Umbar* or *Guler*), of which the ripe fruit were dropping into the water, and apparently taking the figs. It is true that a ripe wild fig is usually so full of maggots that it constitutes a "mixed diet."

In the courtyard of the Black Mosque of Ahmadnagar, long ago desecrated and now used as a public office, there was in my day in a small cistern a fresh-water turtle, about 18 inches long, who had been there as long as any one could remember, and is probably there yet. The water was filtered, and the feed-pipe grated, and so little food would have come to him by that road, and to put any kind of animal food in the cistern would have polluted the water for many people and caused trouble. The turtle was regularly fed by his neighbours with vegetable food, especially, in their season, with parched heads of maize, which he was very fond of. Specimens in my own possession were fed on fresh dead fish, and refused carrion.

They are often taken by the angler with live bait, or raw meat, or worms, and sometimes, as already mentioned, with paste. They give more fun sometimes than one would look for, but often cut the line with their gouge-like jaws, or get into a hole, or bury themselves in

the mud; and often when landed, it is found that they have gorged the hook and the trace must be cut, and the hook recovered afterwards by the cook. It is necessary to use great care in handling them, as they bite savagely, and can take the piece out; the jaws are like two gouges closing on each other.

They make very good soup and curry, and I have been very much amused at a friend's refusing the former when he knew what it was, who had probably often enjoyed the like before, under the belief that it was made of a sea-turtle. They are put into wells and cisterns in the same way as the terrapins, and for the same reasons; *Trionyx javanicus* is our commonest species, and *Chitra indica* the largest. I have seen a bullet glance off the shell of the latter, but it was fired at a considerable angle. The turtle was afterwards killed by another bullet, fired almost vertically down upon the centre of the back, which passed completely through him. These fresh-water tortoises and turtles, if *turned* on their backs, speedily recover their proper position, using their long necks and heads in doing so.

The crocodile (Mahratta "*magar*," "*suswar*") is only locally common in this area, very seldom seen in the tanks and smaller rivers, but occupying particular deep reaches in the great rivers, often in considerable numbers. These are the places to which the larger fish and the turtles (crocodiles are very fond of turtles) retire when the rivers shrink in the dry weather, and where, accordingly, food is plentiful. As far as I am aware, there is only one species known here, *viz.*, *Crocodilus palustris*. I have measured specimens from the Upper Tapti and Bhima 10 feet long, and I do not think that that size is often exceeded here. And though I have heard many crocodile yarns, I do not myself know a single well-authenticated instance of a crocodile's killing a human being in the Deccan or Khandesh. Once, in 1875, I remarked as much to a native official, who immediately said that a man had been killed by one in his "Taluka" (or barony) "last year." Being asked for details, he gave them, upon which I recognised the story as one I had heard in the same place in 1872 as of "last year." I dare say that crocodile is killing that man "last year" to this day. The other form of crocodile-saga always refers to the "next village," and when you get *there*, to the next, and so on, slipping away before the inquirer like the foot of a rainbow before the infant gold-seeker. I believe that the larger and more dangerous *Crocodilus porosus* is found in the lower waters

of most of the great Deccan rivers beyond our boundary. The differences, setting aside size and temper, are that *C. palustris* has two sets of shields on the back of his neck, arranged in two groups of four and six respectively (the four in front), six shields in each transverse row of the middle of the back, and sixteen such rows of dorsal shields altogether to the root of the tail. But in *Crocodilus porosus* the "anterior nuchal plates" are none, or only 2, and then rudimentary, that is, his cousin has a front set of 4 plates on the back of his neck; and he has not, or only two little ones. Its dorsal shields are usually six in a row on one part of the back and eight in the rest (the extra two rudimentary), and there are 17 rows in all, to the root of the tail.

I need hardly say that alligators are not found here, nor anywhere else in Asia, except China, where there is one rare species. The outward and visible sign of a crocodile proper, as distinguished from an alligator, is the fourth tooth of the lower jaw on each side, which grins alike at all seasons, whether the mouth be shut or open, improving a naturally ugly countenance with a hideous fixed snarl. In the alligators, this tooth is received into a sort of sheath or pit in the upper jaw. Some alligators, moreover, have shields on the belly as well as on the back. I have wasted a great deal of time on catching crocodiles, and never caught one, though others have had better luck. Shooting them with the rifle is really good sport. This should be done in the heat of the day, when they lie on banks in the sun. In the morning they are wideawake, and before sunset they begin to forage. They have to be carefully stalked and clean killed, otherwise they get away into some hole, or (I think) bury themselves in the mud, as they are well known to do sometimes, in lakes that dry up for a season, to await the return of the water. Many a hit crocodile goes off leaving a trail of blood on the water, and is never seen again. But if they remain in one spot even for a few seconds after receiving the bullet, that is a sign that they are very hard hit; and in such a case the carcase will generally float within from 30 to 40 hours. I have not had a harpoon that could penetrate the back scales; a good hog-spear, however, does so easily.

The story of their being ball-proof arises chiefly, I think, from the natural unwillingness of man to admit that he has missed. A very ordinary gun will put a bullet through and through any part of them, unless, perhaps, the bullet strike at a very great angle

and glance off. I believe that this once happened to a bullet fired by myself from a very light fowling piece. A shot in the small of the back, head, heart or spine will stop them easily enough. Behind the shoulder is the best shot from the side; but if you shoot from above, as from a high bank or a ship, aim at the root of the neck. Not only is it a good place, but the places above and below are good too and the usual error of a rifle shot is high or low.

A crocodile, lying on a bank, covers his heart (to a great extent) with his left elbow, and a light express bullet will break upon the bones of the arm, doing little hurt. When struck or startled in the water, they will sometimes leap forwards, three or four feet from the surface, like a salmon, and once I saw one, shot through the heart on shore, literally stand on the end of his tail for a second, and fall backwards stone dead. They are not heavy animals; the largest I ever weighed, a female, 8 feet long, was only 100 lbs. in weight, though full of eggs. They are not of much use when you have got them. The bleached skull makes a ghastly trophy, and the skin a very ugly one; but I once got two very handsome shields made of crocodile skins at Ahmedabad. Here I may remark that I have never got the traditional *langles* from the stomach of any crocodile. I have got sticks; what the brute ate them for I can't imagine. The handsome leather used in Europe for cigar cases, bags, and so forth is all made of the skins of young American alligators; the art has not found its way here yet. Natives use the teeth and shields for charms and the oil for medicine, and some low-castes eat the flesh and eggs. There used to be a small tribe in the Tapti valley who devoted their lives to hunting crocodiles, and showed great pluck and skill in it. They used nets, nooses and broad-bladed pikes (not harpoons), and always cut the tail with an axe as soon as possible,—a trick known to other natives besides them. Crocodiles are commonly supposed only to *crawl*, but the young of *C. palustris* can walk and even run. A recent observer has noted the same in Ceylon. I have twice kept young crocodiles alive; they were savage and sulky, refused food, and threw it up when administered by force.

Of other water lizards we have only *Varanus draccena*, the *Ghorpur*, which, however, chiefly comes under notice when *out* of the water, of which it is very independent. It is lucky that Ghorpurs don't get to be much more than four feet long, for they are very active

and greedy, and I have seen one much shorter than that wage a good fight with a small terrier dog. They will eat any animal that they can overpower and swallow, up to young ducks, and I have no doubt that they would eat the old ducks, too, if they could either swallow them whole or carve them in any fashion. They destroy eggs of all sorts, but I don't quite understand how. They don't swallow them whole, for the shells are left.

Young Ghorpurs are among the various lizards, supposed to be venomous and called "*Biscobra*" in this region. The Biscobra of Sind is an Eublepharis, according to Mr. Murray, an ugly creature certainly, and looking really very like the known venomous Heloderma of South America. Mr. Murray found the *secretions of its skin* really to some extent poisonous.

This is no place for going into so long a list as that of the fresh-water snakes. It is, perhaps, enough to say that, although almost all snakes swim well, only those to the manner born can dive well, and it is easy enough to tell the difference between a true water-snake and a mere passenger by water. The latter holds his head much higher, and never stays still in the water, but "keeps moving."

Some snakes, however, are amphibious, and one of these (*Tropidonotus quincunciatus*), the spotted water-snake, is very much commoner here than any of the true fresh-water snakes. They are sometimes caught on hooks, when a frog or fish is the bait, and then they foul the tackle, and make the angler unnecessarily nervous. None of them are poisonous, and I do not think that any venomous land-snake is sufficiently at home in the water to take a bait below the surface. This tropidonotus is the "*pán-diwar*" of the Mahrattas. There are several varieties of colour. Those in dark, muddy, shady waters are a sort of dull tortoise-shell colour; and some in open tanks and streams might almost be described as black and gold. There is one very libellous sort of snake-story which describes water-snakes as climbing up boat's cables to bite people on board. Now, a fresh-water snake could have no motive for going aboard at all; and if he did go aboard and bite people, they need no more die of it than if he was a mouse. As for the sea snakes, which *are* all venomous, they can hardly crawl on the sand, let alone climbing up a cable. But no doubt a really poisonous land snake, swimming across a river, might think a boat a good place to rest in. A cobra or bungarus would easily enough get up the cable, and his misdeeds, if any, would be laid upon

the innocent water snakes. Probably, however, most accidents of this sort arise from snakes being brought on board in cargo or firewood.

Of frogs (*Menduk*, *Bhenki*), we have many. The most conspicuous is the big bull-frog (*Rana tigrina*), an unpopular creature. He eats pretty nearly whatever creature he can catch, and *vice versa*; reminding one of the ancient Gaelic proverb, "This is the government of the waters; the beast that is greatest eats that which is least and the beast that is least shifts for itself."

The next and less known is *Rana esculenta*, the very identical French frog. For want of French cooks he is wasted here upon the storks and catfishes. I never saw *Cacopus globulosus*, a marvellous frog figured by Dr. Gunther, the very representative of Humpty Dumpty among reptiles.

Natives don't usually pay much attention to frogs, but once when I had a lot of men stung by scorpions, a village elder made cataplasms of live frogs pounded between stones, and applied the quivering and mangled reptiles to the injured parts with great success. I think the very nastiness of the remedy gave the sepoys more faith in it.

Tigers are said to eat bull-frogs in the rains, and thereafter to sicken and waste away, just as in Ireland a skinny cat is supposed to have been eating crickets. I think myself that the tiger is probably pretty far gone in famine before he takes to catching frogs, and it is pretty certain that all the frogs he could catch in a day would make him but a poor day's ration.

Of the crustacea of our fresh waters we know but little, and have no standard books on the subject. Crabs (*Telphusida*) are found almost to the top of the ghâts, and furnish food to man, birds, turtles and fishes. They are said to be unwholesome in the hot weather, which is not borne out by my own experience. And at that season certain forest tribes go and grind stones on each other in dry nullas. They say that the crabs mistake the noise for that of waters. At any rate the crabs do come out, and are caught and eaten. Another plan is to drop a bullet or pebble, attached to a string, into the crab's hole, who thereupon nips it and is drawn out holding on to what he, no doubt, supposes a live intruder. The Mahratta names for them are *Kenkad* and *Muta*. The former word, with a dry humour characteristic of that nation, is also applied to *handcuffs*. I have good precedent for introducing these useful articles into my paper, for the United States Commissioners to the Fisheries Exhibition exhibited a

pair with a label stating that they were found "very serviceable in the whale fishery; and carried by most vessels."

A true prawn is found even above the falls of the Godavery, and small shrimps up to at least 2,500 feet on the ghâts. These latter are sufficiently abundant to be dried for sale. A cray fish in the streams of the Satpura is said to reach "a cubit" (*hát*, 19 inches) in length *over all*, and fragments that I found bore out the statement. I use the term cray fish here, as it always has been used in English and French (*ecrevisse*) to mean a crustacean *with* nippers. Some naturalists have attempted to restrict it to those that have none, but the limitation is artificial and cannot succeed.

Of mollusks, the most part are water snails, the most noticeable being the great round ampullaria, as big as a baby's fist. There are at least two mussels (Unio), one with a rather delicate shell and pale olive green epidermis, and one far more solid and of a black or dark brown colour. The latter is said with great probability occasionally to contain pearls. One such pearl is in the Kolapur Museum, and some from Bengal were exhibited at the Fisheries Exhibition. The natives call all univalves *Kuba* or *Kubi*, and all bivalves *Shipi*, or some derivative thereof.

Insects of all sorts swarm in and near the water, but there is no space here for describing them. I do not think that anything like the appearance in swarms of the European Ephemerides (green drake and May-fly) is ever seen in this region. The nearest thing to it is when a swarm of newly-hatched winged white-ants drifts over a river or tank, when the fish may be seen rising at them all over the surface. The same thing happens, but more rarely, with locusts. Mole-crickets, wherever obtainable, are a very good bait for almost all sorts of fish. Waterbeetles attain an enormous size, and no doubt destroy fish spawn and even small fry.

Earthworms (Mahratta *gândul* and *gandrún*) are generally very hard to get, but when they can be got are as useful here as at home. Leeches (*Jalu*) are sufficiently numerous in some tanks to make bathing impossible, but are not otherwise a plague as in some other tropical countries.

A notice of these waters would hardly be complete without some reference to the daily visits of terrestrial animals and birds to the water which are always a remarkable feature of animal life in dry hot climates. The large carnivora usually drink just about dark,

perhaps a little before or after. It is said, too, that after eating they always go to the water, at whatever hour. The small cats do the same; but the jackal usually drinks about 9 or 10 a.m.; and the mongoose and civets even later.

The larger wild ruminants, where much hunted, drink before sunrise and after sunset; but when undisturbed, or after any specially thirsty business, such as love or war, will visit the water at broad noon and before sunset. The small four-horned antelope and the barking deer prefer noon-day; the gazelle usually drinks a little earlier, say, 10 or 11 a.m.

But the general drinking time for birds and beasts is when the morning begins to warm up, say, from half-past eight to half-past nine or ten a.m., when all diurnal animals have been abroad all morning, and want to wet their throats before retiring, probably to keep quiet for the day. The grey partridges and francolins are amongst the first to steal down to the water; and after them come the common sand-grouse; pretty common in this region. The painted grouse, which is found in low thorny jungle, is an exception. It drinks by twilight, often so late that it is only recognised by its very peculiar chuckling note. But after the common grouse (*Pterocles exustus*) come, if there are any about, the pea-fowl, blue pigeon and doves, more rarely the green pigeon (*Crocopus chlorigaster*), according to Dr. Jerdon. I have not myself seen this bird drink, and one I kept in confinement did not seem to care about water, getting much moisture in his juicy food. The authority, however, is conclusive, and I have myself noticed the green pigeon to be commonly found in trees near water about 9 o'clock a.m. and a little before sunset. The monkeys also drink at this hour (9 or 10 a.m.), and so do crows, who take a regular bath, with a good deal of demonstration, as in all their doings. Eagles and hawks come about the same time, and sometimes stand in the water, apparently merely to cool their toes. When any of them look out for fish or frogs they do it on the wing.*

Pretty much the same thing happens again from about an hour before sunset to half-an-hour after it; but besides this the water, if there are any trees or bushes near it, has always a tendency to become the centre of all animal life; and the angler, perhaps, sees

* NOTE.—Several eagles, especially the serpent eagle (*Circactus galicus*), catch frogs on the marshy borders of tanks.

more of this than he would if shooting, or even walking, and for many reasons it is well that he should have a gun-bearer at hand.

This is hardly the place for discussing fishing-nets, but the best to have in a camp is the casting-net, which can be handled by one man. If you have two fishermen, this may well be supplemented by a *gholni*, or shove-net, fixed to two bamboos, and with a large party a seine can be used generally; wherever the water is large enough for the use of a seine, native fishermen will be found in possession of one, or will improvise it by linking smaller nets together. A small boat is useful in "shooting" the seine; and the best portable boats are certainly the canvas "Berthon boats." It is not, however, easy to shoot from them unless after carefully ballasting them, or fitting an outrigger; for, although very hard to upset, they are very easily made to rock, and even the putting up of a gun to the shoulder will cause enough motion to spoil the shot. The same is the case with small native canoes, and the remedies are the same. Safe, though clumsy, rafts are made of gourds lashed to a charpoy or of bullrushes by the natives, but these are apt to sink a few inches below the surface, and should be surmounted by a bath-tub, a pair of wine boxes caulked and painted, or some similar device for keeping the passenger and his ammunition dry.

In some places the natives make round coracles of hides; and in others they use huge circular sheet iron sugar boilers for boats; in either case reminding one of the Wise Men of Gotham in their Bowl.

KESWAL.

ON ABNORMALITIES IN THE HORNS OF RUMINANTS.

By R. A. Sterndale, F.Z.S., &c.

There being several striking examples of deformity in the horns in the Society's collection, I am induced to bring them to notice and to theorize on the causes which have led to such results; and a varied field for speculation is opened, for many questions arise in connection with the subject. The first is, are these abnormalities, in the case of antlered ruminants, transitory or persistent? and, secondly, in the hollow-horned ruminants is the *fons et origo malis* in the osseous or horny formation? Then comes enquiry into the primary cause of such malformation. The whole subject is involved in doubt, and but a mere hypothesis can be arrived at, for almost every day we come across some freak of nature which starts us off into a new channel of conjecture. With regard to the first question, are the deformities of deer transitory or persistent? that is to say,

would a Sambar Stag, who had developed in his seventh year an abnormal tine, reproduce that abnormality the following year—the eighth? or would he revert to his normal form? Now I will give an example from a very fine head in my own collection: the horns are unusually large, the right beam being 45 inches and the left 43 inches in length; on referring to figure 1 in the accompanying plates you will observe a tine of 9 inches long, which is a decided abnormality; there is no reversion or progression towards lower or higher types, but simply a sprout which has taken a direction quite out of the symmetry of known species. Now, to arrive at any conclusion one must consider the process of the growth of antlers: they are produced annually, and with a tendency to increase instead of decrease; on the shedding of the old horn there is a decided determination of blood to the head in the animal; the new growth, a fibro-cartilaginous substance, is nourished by blood vessels, which ramify on the exterior, covered by a sensitive velvety skin; whether this be true venous blood or a specialized fluid of a more albuminous nature is a question which has not as yet to my knowledge been solved. Anyhow, a blood-like fluid is conveyed along the growth of the horn feeding the bony deposits, and it may be that abnormal sprouts are the result of an aneurism in one of the blood channels; but if this be so, my horn brings up another question, for if you will look at the normal antler you will see an excrescence exactly corresponding with the extra tine, yet not so fully developed. Is this the sympathy that one sees exemplified in cases of toothache? The decay of a particular tooth on one side is frequently followed by that of the corresponding one on the other. If this particular stag had been allowed to live for another year, would both antlers have shown an additional tine, or would they have reverted to the normal shape? There is no reason why such deviations should be perpetuated in the same individual or transmitted to his descendants. It was thought at one time that the spike buck of America, which is the many-antlered *Cariacus virginianus*, found occasionally with a single-spiked horn, was a freak of nature transmitted from the first so formed buck to his progeny, and this was gravely advanced in an American Scientific Journal, and it was asserted that the spike horn bucks were gradually crowding out the antlered ones on the principle of the survival of the fittest; however better informed naturalists like Judge Caton proved that these were merely young bucks of the first year whose second season saw them with branching horns.

I am inclined to think that there is neither persistence nor transmission in the abnormalities of antlered deer. I believe in injury being the cause of these freaks.

Sympathy in certain cases of bodily injury affects the horn of that particular side, and this is permanent through life, and in such cases the horns are not shed.

There is a curious bifurcation of the tip of the bez tine in the right antler of a Cashmere Stag's horns in my collection, which must have occurred whilst the point was tender; and this reminds me of what I have recently read in the second volume of the transactions of the Linnean Society of New York regarding the growth of antlers. It is the commonly received idea, accepted by most naturalists, that the blood vessels contract at the burr or base of the horn on its arrival at full growth, and that then, the velvet dries up and is rubbed off by the animal, but the Hon'ble Judge Caton, of Ottawa, Illinois, from observations made in his own deer park, states: "The evidence derived from a very great multitude of observations, made through a course of years, is conclusive that nature prompts the animal to denude its antlers of their covering at a certain period of its growth while yet the blood has as free access to that covering as it ever had."

It is the common impression that the animal is extremely sensitive to pain whilst the velvet is in its quick stage. I am, however, informed by Mr. Phipson that he has seen the old Wapiti Stag, we most of us remember, near the entrance gate in the London Zoo, rubbing his huge antlers whilst the blood flowed freely from each abrasion.

Now I come to a very curious deformity in the Society's collection—figure No. 2. It is that of the left antler of a Cashmere Stag; the right antler is perfectly symmetrical, but the left one, as you will observe, is broken and bent down about 2 inches above the bez antler, and instead of brauching it has formed itself into a club. There is no doubt of the fracture here—it is self-evident. Either from a fall, or a blow from a falling branch, or from some such injury the soft antler was broken, but the velvet held on, and the nourishment continued, but in an interrupted way; the free circulation was impeded, and instead of the tines branching out according to their wont, they coalesced into a knob as we see it here. Of all the deer tribe, I have found the Axis or Spotted deer most given to "sports" in its horn. The normal shape is strictly rusine with three tines, yet 20 per cent. of horns show little sprouts generally at the base of the brow antler. Figure 3 represents one in the Inverarity collection, in which the brow antlers have run riot altogether and the right one has thrown out several branchlets. Probably in this deer there was something constitutionally wrong. I have examined all the deer in the Victoria Gardens and have noticed in the largest stag in the Axis pen, which has very fair sized horns, that each brow antler has an abnormal branch.

Though it is thus easy to build up a theory on the deformities of the antlered ruminants and to speculate on their persistence, a new

train of thought arises entirely in connection with the hollow-horned ruminants. In these, abnormalities must be persistent; with them it is an exemplification of the adage "as the twig is bent, so is the tree inclined," and as their horns are to a certain extent supported by bony cores, it is in these we must look, in the first instance, for the deviation from the usual symmetry. Figure 4 represents a buffalo head, the property of Mr. Inverarity, at present deposited with the Society; the deformity here clearly begins with the bony core; with such soft and easily deflective material as horn, eccentric shapes can be artificially produced, but the deflections must be beyond the limit of the bony core; in the case of this buffalo the deformity, or rather wrong direction, begins from the base and must have been regulated by the core. It is not an uncommon thing to find antelope horns running up almost parallel to each other instead of the usual V shape. I have two such in my own collection. Here the core again gives the direction, and in the numerous cases reported in the *Asian* and elsewhere, of antelope with distorted horns the core is evidently the source of the eccentricity. Figure 5 gives a sketch of an antelope head in the Society's collection; the deflection starts from the base, and the bony core is evidently so twisted that I have not been able to unscrew the horn as can usually be done with dried antelope heads. The horns of tame buffaloes frequently show deviations from the normal type. There is in Bombay at the present moment a magnificent old buffalo with grand horns of a most curious and perfectly symmetrical shape. They are very massive, and come down low, close on to each cheek, and then sweeping round with a curve form a perfect circle at the tips.

A LIST OF THE BOMBAY BUTTERFLIES IN THE SOCIETY'S COLLECTION,

With Notes by Mr. E. H. Aitken.

The butterflies in the Museum of the Bombay Natural History Society are geographically divided into the following collections:—

(1.) A fairly representative, though by no means complete, collection from the Bombay Presidency, exclusive of Sind on the one hand, and Canara on the other, which latter belongs rather to the Malabar region. For these the Society is indebted largely to Mr. R. C. Wroughton, also to Mr. Moscardi, C.S., and other members. This collection is arranged and named.

(2.) A very incomplete collection from Malabar and Canara, partly purchased and partly contributed by Captain T. M. Macpherson. These are arranged and partly named.

(3.) A small collection of British butterflies presented by Mr. R. C. Wroughton.

(4.) A small collection from different parts of the Himalayas, partly obtained by exchange and partly contributed by members.

(5.) A few, interesting, named specimens from the Punjab and from Aden. These were the gift of Major Yerbury.

I take more interest in butterflies on the wing than on the pin, but that the following notes may serve a double purpose, I have based them on a list of the species in the first of the collections enumerated above. I named the collection myself, so that no one else is responsible for the accuracy of the list, and I must protect myself at the outset by disclaiming any pretence to give a complete or discriminative catalogue of the collection. In the present unsettled state of the subject it would be impossible to attempt such a thing without diverting a great deal more of my leisure than I am willing to divert from nature to nomenclature, and I am besides peculiarly disqualified for such a task by my inability to believe in a great many of the species which are accepted by those who seem to be pillars. This will account for the absence from my list of a good many species, under one or two genera in particular, such as *Terias* and *Teracolus*, which, if they are species at all, are very common.

I have no systematic notes of the months in which I have caught each species. I regret this, but at the same time I think that the data obtained in this way may be over-valued. Suppose from such notes you deduce the fact that *D. chrysippus*, for example, may be met with every month in the year, is the fact worth recording? There is no butterfly which may not be met with any month in the year, for some pupæ always remain over from one season to the next, and an accident may bring these out at any time. What we want to know is when each species is in season and why? Almost every species has a well-defined season, depending on its food plant. For the great majority this is the latter half of the monsoon, and the two months following, *i.e.*, the period during which the annual vegetation called into life by the rain remains green. Another season is the commencement of spring, which even in this country makes its influence distinctly felt. *A. violæ* comes out at this time. Some species appear at neither of these seasons except by accident. *Virachola isocrates*, for example, where it feeds on the pomegranate, can only be in season when that fruit is ripening. I have tried, as far as I can, from memory and notes, to give the limits of the time during which each species is in season.

NYMPHALIDÆ.

DANAINÆ.

1. *Danais chrysippus*.—This, with the exception, perhaps, of *Terias hecabe*, is the commonest and most ubiquitous butterfly on this side of India. At Kharaghora, on the edge of the Runn of Cutch, this was one of the very few flying things I could get, and my chameleon would starve rather than eat

it. I never found the larva on anything else than *Calotropis gigantea*. Dwarf specimens of this are not uncommon. All our *Danainæ* are on the wing chiefly from about August till the end of the year.

2. *D. dorippus.*—There is one specimen in the collection without locality. I have never met with it, but have known of at least one specimen being caught in Bombay. I believe it to be an occasional variety of *chrysippus*.

3. *D. genutia.*—This is common almost everywhere, though by no means so abundant as the last. One specimen in the Society's collection has that dash of white on the hind wings which is common in specimens of *chrysippus* from Kurrachee (Moore's *D. alcippoides*) and of *dorippus* from Aden. The collection contains also a very remarkable specimen caught at Matheran by Mr. Moscardi in December, 1884, in which the ground-colour throughout is a dull lavender. The markings are normal.

4. *D. limniace.*—This is common too, especially on the hills. I found the larva at Lanowlie in October, feeding on *Hoya viridiflora*. The offensive smell which makes reptiles and birds—if birds eat butterflies at all—reject this family, is particularly strong in this species, and is certainly connected with the extrusion of the yellow plumes. It is also a very difficult insect to kill. Pinching the thorax has a temporary effect, but it soon revives. Even when killed past reviving and pinned, it will continue to wag his head and antennæ satirically for some days. This or any of the last will serve very well to illustrate the intimate connection which there is between colour and habit, not where the protection of the insect, by mimicry or otherwise, is concerned, but simply from an æsthetic point of view. On the underside the greater part of the forewing differs from the hindwing, but a well-defined area at the apex is of the same shade. Now in the *Danais* attitude of rest the forewings drop between the hindwings until precisely this portion and no more projects and is visible. For those who like to theorise I would suggest that the action of light has produced this effect, the warmer tint of the covered portion of the forewing representing the original unbleached colour of the butterfly countless generations ago. A *Khakee* coat often illustrates the same thing!

5. *D. gramnica.*—This is very common on the hills, but comparatively rare in Bombay. It comes out a little later than the foregoing species, being very abundant about Christmas time. I found the larva at Lanowlie in October last year, feeding on *Tylophora carnosa*, also one of the *Asclepiadeaceæ*. It was, I think, the most beautiful larva I have seen. The ground-colour was a rich reddish brown, or claret colour, and on each segment there was a pair of round yellow spots with numerous small bluish-white spots between. On the sides these spots gathered into a conspicuous longitudinal band. The under surface was black. There were only two pairs of filaments, which were nearly straight.

6. *Euplœa core.*—In Bombay this feeds on oleander, but on the hills I have found the larvæ on the wild fig, *Ficus glomerata*. The larva, like those of all the *Danainæ*, rests on the underside of the leaf, a position which exposes it to the notice of birds; but it affects no concealment, and is evidently not edible. The pupa, like a nugget of burnished silver, seems designed to attract attention. Perhaps it acts on the superstition of its enemies. The natural feeling which forms the basis of superstition is not confined to us, lords of creation, and I am disposed to think many insects save their lives by availing themselves of it. This butterfly is a great traveller, as indeed are all the *Danainæ*. They are often to be seen crossing Bombay Harbour from one island to another, and it is a curious question whether they see the land in the distance, or go in the spirit of Columbus.

SATYRINÆ.

7. *Melanitis leda.*—This and the next are insects of the dusk, coming out after the sun is down and dancing round the roots of trees in company after the manner of fairies. A little later they come out of their haunts and fly straight up into the sky as far as eye can follow them, for what purpose I cannot guess. They are thirsty creatures, and will gather in numbers where water has been spilt on the ground, but they prefer whisky. I have found the larva of this feeding on grass. It is difficult to find, being a night feeder and very shy. As the species of grass on which it feeds grows during the monsoon only, except where there is water, this species is in season all the latter part of the rainy season, and in some places for a short while they almost jostle each other for room. About October, when vegetation is drying up, it gives place to the next.

8. *M. ismene.*—This is very similar to the last in its habits, and quite as common, more so on the hills. I am aware that they are supposed to be one species, but on this point I have not given in yet. I have noticed it on alighting fall over on one side until it was almost horizontal, which very much enhanced its likeness to a dead leaf.

9. *Lethe neelgherriensis.*—In the month of March this is very plentiful on the ghâts, but it is not confined to them. I have caught it in the neighbourhood of Bombay. It is similar in habits to the last two.

10. *Lethe europa.*—There is only one specimen of this in the collection, and nothing to show where it came from. I have not met with it.

11. *Mycalesis perseus.*—I have nothing to note about this species. I have caught it in Bombay and elsewhere, but it is not common.

12. *Ypthima philomela.*—This is a humble butterfly, flying along the ground in shady places, but it is not specially crepuscular. It is common in the cold season at Poona, and I think on the hills everywhere.

ACRÆINÆ.

13. *Telchinia violæ.*—This is not very common, but a few appear just before the hot season in Bombay and wherever I have been. I met with some at Mahableswar last March. It seems generally to be on a journey, going steadily in one direction with a feeble flight, but it will stop to sip a flower and is easily caught. I believe it is, like the *Danainæ*, offensive to birds and reptiles.

NYMPHALINÆ.

14. *Atella phalanta.*—This is not rare in Bombay, and one of the commonest species on the hills in March, when people go up for the hot season. I imagine it comes ont after the monsoon and continnes all through the cold weather. It does not remain so long on the wing in Bombay; but many species have their season later on the hills than on the plains. The larva of *A. phalanta* feeds on *Flacourtia montana,* and is easily found if one knows to look for it, not on the higher branches of the trees, but on the young shoots which come up from the roots. The pupa is a lovely object. So is the butterfly when fresh and iridescent. It is one of the most sprightly and characteristic inhabitants of our hill stations, flitting everywhere from bush to bush and even when it settles moving its wings for ever in the restless way peculiar to it.

15. *Argynnis niphe.*—Colonel Swinhoe, in his paper on the *Lepidoptera* of Bombay and the Deccan, published in the proceedings of the Zoological Society of London, February 13, 1885, says that he caught this in Bombay in 1877. This is very interesting. I have hunted butterflies for years in Bombay and never saw a specimen of this. I can hardly believe that such a conspicuous insect could have escaped me entirely. But looking over the list I find several other species, of which I am equally positive that they are not Bombay butterflies, recorded from Bombay in that year, *e.g.*, *Colias fieldii* and *Teracolus danæ*. The inference is that during the famine year many butterflies wandered, as we know birds did, into regions where they were unknown before. There are specimens of *A. niphe* in the Society's collection, contributed by Mr. Newnham from Cutch.

16. *Pyrameis cardui.*—In Bombay this species breaks out in large numbers at irregular seasons in a way for which I cannot account. It feeds on different species of *blumea,* which are all monsoon annuals, and might be expected to be very regular in its appearance. The larvæ are sociable when very young, half a dozen chumming together under the shelter of a little network of silk. The butterfly is not very easy to catch, being a strong flier and wary. It rarely settles except on the ground, and opens its wing much less than the *Junonias.*

17. *Junonia lemonias.*—Though not rare anywhere, this and the next two are pre-eminently Bombay butterflies, loving its ditches and well-watered gardens.

Orithyia and *hierta*, on the other hand, like dry situations. In habits, otherwise, they are very much alike, flitting about one spot and basking in the sun all the hottest hours of the day. This species is in season at the close of the rains.

18. *J. asterie*.—Next to *T. hecabe* and *D. chrysippus*, this is the commonest butterfly in Bombay at the close of the rains and for some time after. It attains in old age to a degree of disreputability and raggedness not often seen in any other species. I am inclined to think this is the result of ineffectual attempts to catch it on the part of lizards, with which it is a favourite food. The larva feeds on *Lippia nodiflora* and *Asteracantha longifolia*, both very abundant in Bombay during the monsoon. by the side of, or actually in water. The larva is scarcely, if at all distinguishable from that of the next species and very like that of *P. cardui*.

19. *J. almana*.—This comes out at the same season, but is not so common as the last. The larva feeds on *A. longifolia*: I never found it on *L. nodiflora*. Colonel Swinhoe, in the paper above mentioned, suggests that this and the last are one species. I believe the suggestion was made by Mr. de Nicéville before, and the opinion of two such authorities is entitled to respect, but as Colonel Swinhoe appears to quote me in support of his view, I ought to say that I do not share it. It is true, as he says that I reared both species from a lot of larvæ taken together, but they were taken from a ditch in which there may have been the offspring of fifty parents. This proves nothing. Colonel Swinhoe further says that he has a large series of examples showing every stage of variety between the two. I am disposed to think he might apply the same test with disastrous effect to a score or so of the species which appear in his own list under the genera *Ixias*, *Teracolus* and *Terias*; but that is a point on which opinions will differ. In this case, at any rate, I doubt the applicability of the test. I have not seen many specimens from other parts of India, but I have reared and caught plenty in Bombay, and I have no hesitation in asserting that here both forms are remarkable for their freedom from variation. For this reason I put down one or two intermediate specimens which I have seen as hybrids. In the Society's collection there is one specimen intermediate between *J. asterie* and *J. lemonias*, which for the same reason, I believe to be a hybrid, though *lemonias* is a much more variable insect than either *asterie* or *almana*. Of course, these two may very well be distinct forms of one dimorphic insect. This is a very different thing, not in itself improbable; but Colonel Swinhoe's argument from intermediate varieties tells rather against than for such a theory, and I do not know of any other reason for entertaining it.

20. *J. hierta*.—This is not uncommon in Bombay on the uncultivated parts of Cumballa Hill and about dry stubble fields. It and the next appear later in the year than the preceding species.

21. *J. orithyia.*—This is *par excellence* the *Junonia* of the Deccan, delighting in dry hills and stony plains. On the bare plateau of Lanowlie I have found it very abundant in company with the last, in February revelling in the wealth of minute wild flowers which clothe the ground in that favoured spot.

22. *Precis iphita.*—After the rains this butterfly is very plentiful, especially among the thorny jungle which covers the little hills of the Konkan. It is also one of the most familiar species on the ghats. The depth of colour on the underside varies much, and the white spot is sometimes present and sometimes absent. I have never seen specimens here as large as some which come from the Himalayas. It has all the habits of a *Junonia*, and its colour seems inappropriate, for it lives in the midst of green foliage and rarely settles on the ground.

23. *Kallima wardi.*—I believe this grand butterfly is fairly common in every well-wooded part of the country. It appears chiefly in March, April and May, when dead leaves are in fashion, and haunts dry nullahs and ravines, flashing into sight suddenly and as suddenly disappearing into a tree where, after long and cautious peering, you (fail to) discern it sitting motionless on the trunk, inaccessible to your net of course. When you do catch one, it is broken. I suppose their habit of settling in the interior of a tree, upon the trunk or larger branches, tends to break their wings. Last March, the Rev. A. B. Watson, of Poona, made the discovery that this and several other species which most successfully defy the net, such as *Charaxes athamas*, may be captured wholesale at sugar. He had sugared some trees for moths without success, but passing afterwards by daylight, he found that they had become a rendezvous for half a dozen species of butterflies, of which he took as many as he pleased, the present species, in particular, being so infatuated or so drunk that it allowed itself to be taken with the fingers.

24. *Charaxes imma.*—I became aware of its existence of this striking butterfly only last December, when Mr. J. Davidson and I spent part of two days at Matheran in trying to capture two specimens, or rather, I should say, one specimen, for when we got them we found that only half of each remained. I have found since that the species is by no means uncommon on the ghats from December till March at least; but it does not put itself in the way of being converted into specimens. It comes out about 10 o'clock, and, selecting a tree with bright shiny leaves, perches bolt upright in the middle of a particular leaf, just a foot above the highest point you can reach with your net. Whether by accident or design, the position is fenced on all sides with a creeper whose sharp-curved thorns lay hold of everything that passes them and let go nothing. There the proud creature sits, chasing away any other butterfly that approaches, and returning to the same leaf. If

you pelt it with stones, it darts off, takes a short circuit and returns to the same leaf. You may pelt it for an hour with the same result. You may easily circumvent it, however, by erecting a platform of stones under its perch, but your aim must be sure and your stroke sudden, for no other butterfly goes off with such rapidity. There is only one specimen of this in the Society's collection, a male which I caught at Khandalla.

25. *Charaxes athamas.*—This is common enough on the ghats, chiefly, I think, from December to March. It is very similar in its habits to the last, and almost as difficult to capture. They have a *penchant* for certain places, and there seems to be one permanently resident at the reversing station on the Thull Ghat. In the Society's collection there are one or two old specimens of large size, with the apical spot which is wanting in the smaller form.

26. *Charaxes fabius.*—This is not so common as the last, and I know little about it. It occurs in Bombay sparingly. There are four specimens in the collection from Khandesh and the Tanna district.

27. *Cyrestis thyodamas.*—This was very common at Mahableshwar last cold season, from December till March at least. Whether it is usually so I cannot say. I never before met with it, nor heard of its occurrence in the Presidency. I collected a good many specimens, which are decidedly smaller and, I think, better marked than specimens from the Himalayas. It is a sprightly creature, skimming along with the flight of a *Neptis* or an *Athyma*, settling on the upperside of a leaf, with its wings rigidly expanded, then adroitly transferring itself to the underside of the same leaf. It sees remarkably well, but does not settle very high, and is easily caught. I do not think it ever closes its wings, even when it settles on the ground.

28. *Ergolis ariadne.*—I am not sure I have caught this in Bombay, but it is everywhere on the hills during the cold season. It flies low. Mr. Davidson sent me a number of the larvæ from Dhulia in Khandesh in the month of October, together with those of the next, from which they were almost indistinguishable. The pupæ were quite indistinguishable, at least to my discernment. They fed on *Tragia cannabina.*

29. *Byblia ilithyia.*—The specimens in the Society's collection are from Cutch and Dhulia, but I have met with it in Poona. It flies low.

30. *Neptis varmona.*—This species is common enough in Bombay and Poona after the monsoon, and still more so on the hills as late as March. It frequents gardens and hedges, and has a characteristic flight, steady and straight, with jerky strokes of its wings, between which they remain stiffly expanded.

31. *Neptis ophiana.*—I met with a few specimens of this at Mahableshwar last March. It was new to me, but on the wing is so like *Athyma perius* that it may have easily escaped my notice before.

32. *Athyma perius.*—This is common at Khandalla, Lanowlie and Matheran, but I did not find it last March at Mahableshwar, which is 2,000 feet higher. It does not occur on the plains. I found the larva at Matheran in March, feeling on *Glochidion lanceolatum*, one of the commonest trees on the hill. This species seems to lay its eggs by preference on the young shoots that come up from the roots, like *A. phalanta*.

33. *Euthalia garuda.*—I think this butterfly is less common in the jungle than it is about human dwellings. It loves to bask on old grey walls and may be found making itself happy in the dirtiest parts of the native town. I am quite sure it prefers the liquids which it sips from the roadside gutter to the nectar of any flower. The larva may be found in the month of October, and no doubt later, on the mango tree. I found one once on a rose bush, to which it had done some mischief. It is a difficult larva to rear, sulking and refusing to feed. It eats only at night, remaining motionless all day, and the interlacings of its light green spines form such a perfect imitation of the venation of a leaf that it must very easily escape detection.

34. *E. lubentina.*—This is not very rare on the hills, but seems to keep to the tops of trees, basking in the sun. I have found it at Matheran in December.

35. *Symphædra nais.*—In structure this is said to be near to *Euthalia*; in habits it is a *Junonia*, or perhaps, I should rather say, a *Pyrameis*, flying low and alighting generally on the ground, where it basks with wings expanded. I have not met with it in Bombay, but it is not uncommon at Uran, only five miles from Bombay, and may be found I dare say, throughout the low jungles of the Tanna district. I think its chief season is the close of the monsoon, but have found it in May. There is some difference in the depth of colour in different specimens from the same region.

36. *Hypolimnas misippus.*—This is very common after the rains. The larva feeds on *Portulacca oleracea*, which is a monsoon weed in Bombay. I think Boisduval's enthusiasm carries him too far when he says that the mimicry of *D. chrysippus* by this species extends even to their larvæ, which at first sight have a superficial resemblance. This is a spiny larva of the *Junonia* type, and does not need to mimic anything, because nothing is under temptation to eat it. Females of the *dorippus* type are not rare, and there is one in the Society's collection.

37. *Hypolimnas avia.*—When the first showers of the monsoon have fallen in June, a large number of the females of this butterfly appear, without a single male being visible. Two or three months later, males appear in great abundance in some places, followed after an interval by females. I noticed this particularly in 1878 at Uran, where the low

jungle on the hill sides literally swarmed with this species, and I have at other times, without noting dates so precisely, found one sex abundant without the other. In Bombay and Poona this species is common about the close of the rainy season, though never so plentiful as the next. It wanders little, and I have watched a fine male in the garden day after day, basking on the same bush and sucking the same flowers, fiercely chasing all rivals away, until it was old and faded and broken, and finally disappeared. I do not think they live much over a week, but this is a difficult point to settle, because in captivity there are unnatural conditions which may lengthen as well as shorten an insect's life.

38. *H. bolina.*—This is the least common of the three species in Bombay. In collections from Malabar, it is, I think, the commonest. Perhaps it is more a denizen of the jungle and rarer in gardens. Like the others, it appears during the latter half of the monsoon and for a short time after.

A NEW SPECIES OF *ALGA*

CONFERVA THERMALIS BIRDWOODII.

(With an Illustration.)

DISCOVERED AMONG THE HOT-WATER ALGÆ FROM VAJRABAI
EXHIBITED BEFORE THE BOTANICAL SECTION ON 15TH MARCH 1886.

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I visited the hot-water springs of Vajrâbâi near Bhiwandi in the Thana Collectorate a fortnight ago. The place has been described in the Indian Antiquary of March 1875 (page 66) by Mr. Sinclair, of the Bombay Civil Service, one of our able co-adjutors and generous contributors in the Zoological Section. The springs occur, he says, in or near the bed of the Tansa River at the village of Wadouli, about twelve miles due north of Bhiwandi. Those at Akloli and Ganeshpuri have a temperature of about 100° F. The water is stored, as it bubbles up from the underground springs, in a couple of big basins built of black basaltic stones, about eight feet by twelve in dimensions and four feet deep. The water bubbles up hot through circular holes cut out at the bottom of the basin. It has a sulphurous taste and smell. It was analysed by Drs. Giraud and Haines in January 1855, but no note seems to have been made of this quality of the water. The analysis is given in the Transactions of the Medical and Physical Society of

Bombay (page 24, Vol. V.) and is as follows :—In 10,000 parts or grain-measures :—

Specific gravity at 60° F.		1002·0
Chloride of sodium	12·41	
Chloride of calcium	7·07	
Sulphate of lime	2·08	
Silica...	·88	
Total Solids ...	22·64	

The temperature of the water at source is noted 120° F.

The Algæ that I have collected are from the hottest springs of Gorakha-Machhindra, the temperature of which is 130° F.

Very few Algæ are described as the inhabitants of hot springs. Cooke, in his recent work on British Water Algæ, mentions only four—*Stigeoclonium thermale*, *Gleocapsa arenaria*, *Spirulina oscillaroides* (variety *Minutissima*), and *Oscillaria thermalis*. Hassall mentions *Oscillatoria thermalis* (page 250, Vol. I., British Freshwater Algæ) as being found in a stream of hot water at Stevenston, but, as Cooke rightly remarks, Hassall's illustration is not sufficiently graphic as to enable the reader to recognize the species. Hassall, however, observes that some of the Oscillatoreæ are found in mineral waters and in such as are absolutely hot and almost boiling.

Kützing, in his work "Species Algarum," describes *Spirulina subtilissima* as being found in some Italian hot springs. The *Spirulina thermalis* is found in the hot springs of Italy and Bohemia (Carlsbad). He also describes, among the doubtful species which he has not fully recognized, *Anabaena thermalis*, found in the Algerian River Oued-el-Hammam, which derives its waters from a hot spring. *Rhizoclonium Crispum* is also described by the same Algologist as being found in the hot springs of Germany and Italy.

Thus it will be seen that the Algal inhabitants of thermal springs are few and far between. I was struck during my visit to Vajrâbâi with the rank growth of the Algæ now exhibited before this Meeting. They were growing luxuriantly, and looked in their recent and natural condition, richly and beautifully green, firmly fixed on to the loose pebbles that were rolling in the stream and to the black basaltic stones lying along the current of the continuously streaming water, the high temperature of which the human hand could not stand for more than two consecutive minutes.

I found four varieties of Algæ in the different springs about the place :—

(1) A species of Ulothrix, not very different in structure from *Ulothrix Radicans* of Cooke.

(2) A species of Nostoc with its very minutely beaded appearance.

(3) A Conferva very similar to *Chætomorpha implexa (vide* p. 140, Cooke's Algæ, plate 54, fig. 6).

These three varieties will by and bye receive special treatment at my hands, but to-day I propose to examine in detail the fourth species of Conferva which I have not seen described anywhere in Kutzing, Cooke, Hassall or Mrs. Gatty.

(4) To the naked eye this variety of Conferva is visible in the shape of fine hairy filaments of beautiful rich green. Under the microscope with a $\frac{1}{4}$ inch objective the structure is seen in detail, and is not unlike that of *Enteromorpha Percursa* described and figured by Mrs. Alfred Gatty in her British Seaweeds under No. 350, Plate LXXII, the difference being that our specimen has distinct dissepiments in the body of the Alga and tretrasporous arrangement of the zoospores inside the tubular segments. Following Mrs. Gatty's mode of description given in her work, I here briefly give the result of my examination of the newly-discovered Alga.

Color.—Bright rich green when in the hot water ; turning olive green on being kept in cold water, or on drying.

Substance.—Soft ; can be easily torn off.

Character of frond.—Single ; bearing occasionally slender spine-like branchlets, short and tapering, not distinctly jointed, growing in tufts.

Joints.—Small, numerous, faintly marked, with from four to six dissepiments in the long axis of the Alga. Smaller horizontal joints separating the endochrome and zoospores into spaces $\frac{1}{1,000}$ to $\frac{1}{3,000}$ inch in length and $\frac{1}{1,000}$ inch in breadth.

Measurements.—4 to 6 inches high when standing in the hot stream in tufts.

Fructification.—Unknown. In some of the mature segments the central mass of coloring matter constituting the sporidium is arranged in a tetrasporous manner, the contents escaping in due time, probably by rupture of the segment walls.

As the species is quite a new one, requiring a designation, I have obtained the Honorable Mr. Justice Birdwood's permission to associate his name with the Alga, as he is at present the President of our Botany Section; and as I wish to mark the high sense of esteem and respect I entertain for him as an accomplished and practical naturalist, and as a kind and indefatigable worker in the interests of humanity, I call the Alga *Conferva Thermalis Birdwoodii*, and so be it known in the weedy world.

K. R. KIRTIKAR.

NOTE ON FREQUENCY OF PARASITES IN INDIAN ARMY HORSES.

By V. S. J. H. Steel, A.V.D.,

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In August 1884, I examined with care the bodies of twelve Light Cavalry horses destroyed on account of age or incurable injury at Bangalore. The results are, in some respects, remarkable. Thus, no doubt is left as to the richness of the zoological field explored by me; every one of these twelve horses contained large numbers of parasites of two or more species. Further, a young mare, the only Australian of the lot, had two forms of parasite which were not found in any of the others; this suggests the question as to whether she can have brought those forms from the depôt at Oossoor some two years before, or from Australia some three years before, her destruction. Again, certain parasites commonly seen during *post mortems* of horses were conspicuous by their absence; echinococcus cysts were not found in the liver, nor armed strongyles in the anterior mesenteric artery, nor were any thread-worms present in the respiratory passages, nor flukes in the liver. If well-fed and cared-for horses were thus infested, how much more so must be country ponies and horses "roughing it" out in the districts. All the horses had been watered from the same tank; had been standing in open lines; and had been similarly fed for the six months previous to destruction. Their fodder mainly consisted of fresh Hariali or Dhoob grass, more or less moist from washing, but fairly well cleaned as regards removal of mud, dirt, and foreign grasses. Their gram was boiled coolthee.

Parasites found in various situations.

No.	In Stomach.	In Cæcum.	In Colon.
1	Bots and small round-worms.	[One ascaris megalocephala in duodenum]	Oxyurides (and in rectum).
2	Bots	Str. armatus and str. tetracanthus.	
3	A few bots.....	Str. armatus	Str. armatus and amphistoma collinsii.
4	A very few bots	One worm cyst..	Amphi. collinsii (at commencement).
5	Bots, a large cyst, a few small thread-worms.	.....	Str. armatus (a few), str. tetracanthus, and amphi. collinsii (many) at commencement of double colon.
6	A number of bots and of small thread-worms.	Str. armatus and str. tetracanthus (immature?); also amphistoma collinsii.	Str. armatus and str. tetracanthus (immature?); also amphi. collinsii.
7	Bots.....	Str. armatus, str. tetracanthus (a few immature?); also amphi. collinsii (some).	Str. armatus, str. tetracanthus (a few immature?), amphi. collinsii (some) at commencement of double colon.
8	Many bots, a few small thread-worms.	A few mature str. armatus.	A few mature str. armatus.
9	A few bots	A few str. armatus	Str. armatus and amphi. collinsii (a few) at commencement.
10	Many bots	One small cyst, str. tetracanthus? and a few amphistomes.	Amphistomes, str. armatus, and str. tetracanthus (in enormous numbers).
11	Bots and an enormous worm tumour.	A few tumours and small thread-worms (str. tetracanthus?).	Numerous amphistomes.
12	Bots and many small round-worms.	One tænia, many str. armatus.	A few amphistomes; blood spots as though from parasites.

The evidence given here is of two kinds: (*a*) Positive—including presence of parasites or indications of their having been present; and (*b*) Negative—the absence of parasites and of traces of them.

We have positive evidence of the occurrence of parasites as follows:—

1. Bots, *the larvæ of œstrus equi*, in the stomach only, from which we infer that these partial parasites are at Bangalore in August not yet ready to assume the chrysalis stage. We can easily understand why bots were present in every case examined, for all the horses were standing in open lines and fastened by head and heel-ropes; they were, therefore, continuously exposed to the attack of the gad fly and deprived of power to escape it by flight into water or otherwise. The horse gad-fly is, however, not very irritating, and it deposits its eggs on the long hairs of the legs instead of on more sensitive parts, such as the nostrils, attacked by the gad-fly of the sheep, and (by puncture) the skin as in case of the ox gad-fly.

2. *Small stomach thread-worms*, present with or without cystic "abodes." These are representatives of large-mouthed or small-mouthed *spiroptera* (or of both). It is the large-mouthed form which occurs in the cysts. Of these latter, one was closed and two were open. In four cases these small thread-worms were found, but no trace of cyst; these were probably the small-mouthed form; unfortunately no microscopical examination was made to settle this point.

3. *Ascaris megalocephala*, in only one case out of twelve, is probably considerably below its frequency among horses in England. The specimen was small and apparently immature.

4. *Oxyuris curvula* in only one case. This parasite, the presence of which is denoted by a white or yellowish deposit of ova around the anus of the host, is of frequent occurrence in the rectum of country ponies, and certainly is not rare in India. Its infrequency in these horses was probably due to this not being its "season" for abode in the rectum, or, as this host was a "Waler" and young as compared with the most of the other horses, the oxyurides may have been brought from the Oossoor Depôt or from Australia. In support of this latter view is the fact that the parasite is very frequent in recently imported "Walers," but opposed to it is the fact that the host had been some two years in the ranks and nearly three years in this country.

5. The single tape-worm observed was apparently a *Tœnia perfoliata*; it was a wretched specimen obtained from a Persian horse which had been some eighteen months in the country and had been marched from Bombay to Bangalore after purchase. I am inclined to think he brought this tape-worm with him, perhaps from Persia. This species of parasite is frequent among asses in England and not rare in the horse. The blood spots on the lining membrane of the colon in the case from which it was taken may have resulted from previous and recent occupation by other individuals of this species, but there was no sign of more than the one which was met with in the cæcum. Amphistomes were also present in this case, but they seldom cause blood spots. The effects of involuntary change of country by parasites on import or export of their hosts would be an interesting study—which of them in their unintentionally adopted countries find the complex requisites for their strange metamorphoses in development remains to be established.

6. *Strongylus armatus* was in five cases found in both cæcum and colon, twice in the cæcum and not in the colon; twice in the

colon and not in the cæcum. In all cases the parasite was in the mature form, and in no case was the larval armed-strongyle found in the anterior mesenteric artery causing "worm aneurism." It is evident that in August in Bangalore the strongyle is in the adult dung-eating stage and found in the large intestine—whether this is the case in the rest of India remains to be proved. These are the worms considered by Böllinger as a frequent cause of colic.

7. The evidence about *Strongylus tetracanthus*, though conclusive as to presence in some cases, is not invariably satisfactory. The parasites seen were small thread-worms of a white color (entered as "immature *str. tetracanthus*" in my rough records as prepared at the time). They seldom (*i.e.*, in only one case infesting the cæcum and in one infesting the colon) had the distinctive red colour of *str. tetracanthus*. They more resembled spiroptera in four cases of the cæcum and three of the colon. Not in a single case did I find the form which has been called *trichonema, arcuata, i.e.*, the young *str. tetracanthus* forming small rings in the substance of the mucous membrane of the cæcum and commencing portion of the colon. But in one case was a cyst of the cæcal mucous membrane, and in two other instances where the small white worms were *not* found were cysts, one burst, the other unopened. No microscopical diagnosis, unfortunately, was made of the "small white worms," so *we must leave it an open question whether a form of speroptera is found in the cæcum of the horse.* The cysts may possibly have resulted from migrating *str. armati.*

8. *Amphistoma collinsii*, a form of trematode, was found in the cæcum in three cases, but in the colon in no less than nine. From this we might infer that the latter is specially its habitat. The commencement portion of the colon is most frequently invaded. I would in this connection suggest the view that *frequency of parasites such as are introduced with the food or water is found in the former case in the stomach, in the latter in the cæcum or commencement of the duadenum.* This is a generalization of considerable importance and worthy of discussion; if it be accepted, we may infer that the amphistomes in their larval form are ingested from the muddy water of tanks either free or in the textures of minute larvæ. These amphistomes are very common in horses throughout India.

It is remarkable how much freer from parasites some horses are than others. No. 10's intestines and stomach constituted quite a zoological garden for the helminths. It is remarkable that, even

leaving bots out of the question, in not one of these twelve cases was there freedom from parasites.

I beg to be permitted to close this paper by recommending the interior organs of domesticated and other animals to members of the Society as a "happy hunting ground." There is enormous scope for research, and material in every kitchen and every butcher's establishment. The odour of gastric and intestinal contents may not be so enticing as that of the hill air, the ocean breeze, or the fresh dry atmosphere of the maidan, but the aroma and gases from animal's bowels are harmless, and (I speak from experience) make one wondrous hungry! Again, consider the importance of the problems to be solved; *in every part of the world the same endo-parasitic species are subjected to the same surrounding conditions of food, temperature, and reaction; any specialities of geographical range must depend on influences from without; thus our search for causes of parasitic invasion should be limited in its range and much facilitated.* The remarkable biological phenomena observed in study of the life-history of parasites, and their considerable influence on the health and even life of those higher animals they occupy as "guests," render them a specially interesting study to the medical or veterinary worker.

J. H. S.

LIST OF BIRDS COLLECTED AND PRESENTED TO THE SOCIETY

By Mr. A. T. H. NEWNHAM, S.C., 10th N.I.

1. Neophron ginginianus ..... White-Scavenger Vulture.
2. Falco peregrinus ..... Peregrine Falcon.
3. Astur badius ..... Shikra.
4. Accipiter nisus ..... Sparrow Hawk.
5. Aquila vindhiana (eggs) ..... Tawny Eagle.
6. Hieraetus pennatus ..... Booted Eagle.
7. Circaëtus gallicus ..... Bonelli's Eagle.
8. Nisaetus fasciatus ..... Crestless Hawk-Eagle.
11. Butastur teesa ..... White-eyed Buzzard.
12 to 15. Circus macrurus ..... Pale Harrier.
16, 17. Carine brama ..... Spotted Owlet.
18. Coracias indica ..... Indian Roller.
19 to 21. Halcyon smyrnensis ..... White-breasted Kingfisher.
22, 23. Ceryle rudis ..... Fied Kingfisher.
24. Palæornis torquatus ..... Rose-ringed Paroquet.
25. Ynnx torquilla ..... Wryneck.
26. Endynamis honorata ..... Indian Koel.
27. Cinnyris asiatica ..... Purple Honeysucker.

28. Lanius lahtora ..... Grey Shrike.
29. Lanius erythronotus ..... Rufous-backed Shrike.
30. Lanius vittatus ..... Bay-backed Shrike.
31, 32. Lanius isabellinus ..... Pale Shrike.
33, 34. Pericrocotus erythropygius ..... White-bellied Minivet.
35. Pyctoris sinensis... ..... Yellow-eyed Babbler.
36. Thamnobia cambaiensis ..... Indian Robin.
37. Pratincola caprata ..... White-winged Bush-chat.
38, 39. Pratincola indica ..... Indian Bush-chat.
44, 45. Cyanecula succica ..... Blue Throat.
46. Franklinia buchanani ..... Rufous-fronted Warbler.
47. Franklinia buchanani ..... Do. do.
50. Motacilla Maderaspatensis ..... Large-pied Wagtail.
51. M. dukhunensis ..... White-faced do.
52. M. leucopsis... .....
56, 57. Agrodoma campestris ..... Stone Pipit.
58. Agrodoma sordida ..... Brown Rock Pipit.
59, 60. Gymnoris flavicollis ..... Yellow-throated Sparrow.
61. Emberiza striolata ..... Striolated Bunting.
62. Mirafra erythroptera ..... Red-winged Bush Lark.
64. Alaudula raytal ..... Indian Sky Lark.
65. Spizalauda deva..... Crested Lark.
67, 68, 69. Pterocles arenarius..... Large Sand Grouse.
70. P. fasciatus ..... Painted Sand Grouse.
71, 72, 73. P. senegallus..... Spotted Sand Grouse.
74, 75, 76. P. exustus ..... Common Sand Grouse.
77, 78. Francolinus vulgaris ..... Black-Partridge.
79. Perdicula asiatica ..... Jungle Bush Quail.
80. Houbara McQueenii ..... Houbara.
81. Cursorius gallicus ..... Cream-colored Courser.
82. Chettusia gregaria..... Black-sided Lapwing.
83. Lobipluvia malabarica..... Yellow-wattled Lapwing.
84. Œdicnemus scolopax ..... Stone Plover.
86. Totanus ochropus ..... Green Sandpiper.
87. Totanus glottis ..... Green Shank.
89. Himantopus candidus ..... Stilt.
90. Fulica atra..... Coot.
91, 92. Ardetta sinensis..... Yellow Bittern.
93. Botaurus stellaris ..... Bittern.
94. Dendrocygna javanica ..... Whistling Teal.
95. Anas boschas ..... English Mallard.
96, 97. Chaulelasmus streperus ..... Gadwall.
98. Mareca penelope ..... Widgeon.
99, 100. Querquedula crecca ..... Teal.

Additional.

103. Elanus cærulens ..... The Black-winged Kite.
104. Rhynchæa bengalensis ..... The Painted Snipe.
105. Gallinago gallinaria ..... The Common Snipe.

ZOOLOGICAL NOTES.

NOTE ON AN *OLIGODON* (*SUBPUNCTATUS?*) FOUND AT DAHANU, NORTH KONKAN, MARCH 1886.

By Mr. G. Vidal, C.S.

Description.—Length 11½. Scales 17. Upper labials 8 (4, 5, 6 entering orbit).

Minute black spots on the dorsal line about every third scale *not* white edged.

A lateral streak of minute black specks.

Scuta black spotted on each side.

This specimen agrees with the description of *Subpunctatus* (D *et* B), except that the scales are in 17 rows and not 15, and that the dorsal spots are plain and not white edged.

In the number of rows of scales it agrees with *Spini punctatus* (Tan), but the latter, according to the description, has 9 upper labials and no ventral dots.

G. VIDAL.

Pteropus Edwardsii.—One of the 21st of May, one of the hottest days, I suppose, that man has endured on this side of India, I was at Belapur near Panvel, and at about 1 o'clock in the day I came upon several trees covered with Flying Foxes, all wideawake and *fanning themselves* hard with one wing. Some used the right wing and some the left, but not one was at rest. More than a hundred wings waving at once produced a very striking effect, and I cannot think that the habit, if at all general, can have altogether escaped notice. I am curious to know if anyone else has observed it.

E. H. AITKEN.

White-ants.—The following seems worth noting. I have heard of similar cases, but this is the first that has come under my own observation. One of the windows of the travellers' bungalow at Panvel had been attacked by white-ants, when it was opened and left open for two days, thus cutting them off from their base of operations. Instead of working along to the side of the window and going down by the frame, they had made an earthen pipe, three inches long, to connect the window with the sill below. The pipe was perfectly straight, like a mill chimney, and very thin, just wide enough to allow passage for one ant at a time; so they must have had some arrangement for obtaining "line clear" before entering at either end. White-ants being blind, it is an interesting question by what sense they assured themselves when they commenced their pipe that they were not working out into space.

E. H. AITKEN.

Editor's Note.—A chest of drawers was removed about 4 or 5 inches away from a wall. The feet of the chest were inserted in saucers of turmeric powder, and the contents were considered safe. But on opening one drawer after a time, it was found full of white-ants. On looking behind the chest, there was discovered a track leading up the wall to a level with the drawer, and then a bridge consisting of a single pipe was thrown across and the drawer entered.

E. A. S.

POISONOUS LIZARDS, THE BIS-COBRA.

Editor's Note.—In a letter to Mr. Phipson, Honorary Secretary to the Society, Mr. Ommanney, Under-Secretary to the Government of Bombay, states that in the official reports seven deaths in Guzerat are put down as having been caused by a poisonous lizard. He supposes this to be the much-discussed Bis-Cobra, and asks for information concerning it or any other poisonous lizard, if such a thing exists in this part of the world. Mr. Phipson replied that "all naturalists are of opinion that no such thing as a poisonous lizard exists in this country. The belief to the contrary is, however, prevalent in India amongst the ignorant classes in country districts, and is doubtless kept up by the snake-charmers and others whose interest it is to foster public credulity in such matters."

"The word Bis-Cobra is applied to a variety of lizards in different parts of the country, but in all cases where the reptiles have been pointed out by the natives and killed, and sent to museums, they have been at once identified as known species." He adds in a postscript "that according to the highest authority the only lizard the bite of which is known to be poisonous is the Heloderma of the S. W. States of America and Mexico." It is doubtful now whether the venom of the Heloderma is as powerful as has been reported. I believe no authentic case has been known of the death of a human being from its bite, though small animals suffer to a fatal extent. I have never seen any lizard in India like it; any sort of lizard may be a Bis-Cobra to a native. I once saw a whole *Kacheri* full of people put to flight by a common garden monitor. From what I remember of the Heloderma which was presented to the London Gardens by, I think, Sir John Lobbock, the nearest approach in form is our *Uromastix hardwickii*, only flatter, and yellow and black instead of earthy brown, the whole body covered with small tubercles; a very repulsive looking creature, and capable of giving a severe bite. I believe it killed some small animals: Guinea-pigs and the like. It arrived in a tin box long and narrow, and when this was opened at the end it would not come out, but planted its claws against a ledge at the opening and refused to budge. I think it was Mr. Bartlett himself who told me that, not believing in its poisonous properties, he caught it by the head and pulled it out.

R. A. S.

ON CONJUGAL INFIDELITY AMONG BIRDS.

By Mr. W. E. Hart.

I was interested some weeks ago in reading in the pages of "Nature" several accounts of instances of conjugal infidelity among birds. Curiously enough a somewhat peculiar case came under my own observation shortly afterwards. About the end of April a pair of wild pigeons, in appearance resembling the "blue rock" of England, began to build their nest in my porch on the top of one of the pillars supporting it. One night, before the nest had been completed, the hen bird was attacked in her sleep by some beast (I suppose a rat) which bit off one of her legs. She did not seem much worse for the loss, but from that time nothing seemed to go right with the nest. It was constantly

falling to the ground. On two occasions after an egg had been laid in it. At first I thought this was due to the crows, but I think now it may have been caused by the awkwardness of the hen bird, in her mutilated condition, when alighting on or rising from her nest. In vain the unhappy pair time after time repaired the disaster, shifting the position of the nest from one corner to another till they had tried all four pillars. When we went to Matheran in May the nest was still unfinished, the eggs still unlaid, and there seemed no chance of our unfortunate friends ever succeeding in raising a brood of chicks. Still we could not but admire and sympathize with their patient, persevering industry and fidelity to each other in adversity, and recal the traditions we had heard of how the pigeon, the emblem of love, mates for life, and how, when death takes one of the fond couple, the survivor pines away and dies of grief. Alas! for another shattered illusion! When we came back from Matheran we found the nest finished indeed, and tenanted by a pair of well-grown chicks nearly fledged, but they were not the children of our one-legged friend. Her faithless spouse had brought home a second bride with the proper complement of limbs who now ruled his house, accepted his caresses, and regulated the affairs of his nursery, while the first looked sadly on, standing sorrowful and solitary on her one leg. She, poor thing, apparently cannot get it out of her head that she is the true wife and real mistress of the house, for she often tries to approach the nest or the chicks. But as often as she does so, her rival flies at her and drives her off, and even carries her hostility so far as to attack her unprovoked when she is sitting quietly by herself at a distance. Lothario, I am glad to say, never joins in actively ill-treating the deserted one. But his coldness and neglect must be as hard to bear. As she never leaves the neighbourhood, I can only hope her forlorn appearance acts as a perpetual blister to his conscience.

W. E. H.

BOTANICAL NOTES.

NOTE ON THE *FERONIA ELEPHANTUM* (ELEPHANT OR WOOD APPLE) AS A TIMBER TREE.

By Mr. Frank Rose.

N. O. RUTACEÆ (Aurantiaceœ, or Orange Order.)

This apparently insignificant Indian tree seems not to have found a description in Balfour's "Class Book of Botany, 1854;" yet a Botanist in 1829 deemed it a "noble Indian tree." Be that as it may, besides being a medicinal agent, its properties, I think, are so well known as to need no reiteration in this journal; suffice it to say that every part of this "common jungle tree" is reputed to be useful. It was gracefully named "*Feronia*" after the "Goddess of Forests" by the celebrated Portuguese Botanist Correa de Serra. My object in writing on this subject is to question the assertion of a respected writer, who states that

the timber is "*used for house building*"; probably he meant only for *temporary* structures? I write from experience, and beg to differ from him. A beam of this wood, to save expense, was put up in a bungalow in 1880, and in 1886 perforations by borers were the result! I anticipated this, and informed the builder at the time that a certain percentage of saccharine matter is contained in this tree, consequently, it was open to the ravages of insects. The timber is certainly tough, the average weight per c. ft. = 49 lbs.; is almost equal to that of teak (*Tectona grandis*); it planes smoothly and receives a good polish; but *cui bona*?

En passant, CREOSOTE, possessing that powerful antiseptic property, has been recommended for the *preservation of timber*; but instances have occurred where creosote, chloride of zinc, carbolic acid and corrosive sublimate have been used, but without satisfactory results, excepting that they retard the destruction by insects for a couple of years or so, when the above have not penetrated the wood. Creosote, I know, acts like a charm, and is efficacious in *preserving animal substances*. Then in my humble opinion I consider that the wood of the *Feronia* is unfit for permanent structures, though it may be used for agricultural implements, but should not be classed with the "Indian timber trees" of durability.

F. R.

Note by Editor.—The *Feronia, Koit,* or *Katth bel* is mentioned in Balfour's "Timber Trees of India," 1852 Edition, and he reports it as much used for building in Gujerat and Coimbatore, where it is said to be durable, but in Vizagapatam, where it is also much used, it is said to be not very durable, thus confirming Mr. Rose's opinion. Its strength (360 lbs.) is apparently almost equal to teak, but there the comparison ceases; the durability of teak, its properties of resisting insects, and preserving iron from rust are chiefly due to the amount of tar contained in the wood; this tar, which was first brought to my notice by the Gipsies (*Bunjaras*) of the Central Provinces in 1863 or 1864 was sent by me for analysis to the Agri-Horticultural Society of Bengal, and the report will be found in the journal of that time.

R. A. S.

PROCEEDINGS OF THE SOCIETY DURING THE QUARTER.

The usual Monthly Meeting of the Society was held on Monday, April 5th, at 6, Apollo Street, Dr. D. Macdonald, Vice-President, presiding.

The following new Members were elected :—H. H. the Maharaja Saheb of Indore, Sir Jamsetjee Jeejeebhoy, Bart, Captain Street, Mr. N. R. Cumberleye, Captain L. L. Fenton, Captain W. Aves, Mr. G. W. Terry, Mr. J. Franklin, Captain Barclay, Captain Bishop, Mr. H. Van Ruith and Mr. D. George.

Mr. H. M. Phipson then acknowledged receipt of the following contributions to the Society's collections during the past month, and made a few explanatory remarks regarding the specimens :—

Contribution.	Description.	Contributor.
A number of snakes (from B. Burma)	*Bungarus fasciatus*	Capt. C. H. Bingham.
	Naga tripudians (*Var Macera Keantiah.*)	Do.
	Cylindrophis rufus	Do.
	Xenopeltis unicolor	Do.
	Simotes tæniatus	Do.
2 Flying squirrels (alive)	*Pteromys oral* (*Var. Cinera ceus.*)	Genl. J. Watson, V. C., Baroda.
A quantity of insects from Ceylon.	.....	C. A. Stuart.
Skin of a flying squirrel	*Pteromys oral*	Do.
A quantity of fresh-water fish from Savitri River.	.....	W. Sinclair, C.S.
1 Snake.....	*Oligodon subpunctatus* ...	Do.
1 Turtle.....	*Sp. Emys*	Do.
A quantity of sea anemones from Dharamtar.	.....	Do.
2 Sea eels	*Sp. Muræna*	W. H. McCann.
Fossil tooth of elephant from Rangoon.	.....	Wm. Shipp, C.E.
3 Oryx heads from Africa.....	.....	Capt. W. Aves.
5 African gazelles' heads from Africa.	.....	Do.
1 Spring bok head from Africa .	.....	Do.
1 Fresh-water turtle	*Sp. Emys*	G. W. Vidal, C.S.
1 Dotted skink.....	*Eumeces punctatus*.....	Do.
1 Snake.....	*Oligodon subpunctatus* ...	Do.
2 Kangaroo rat (alive)	*Hypsiprymnus rufescens*	G. F. Johnson.
A quantity of corallines.....	.....	Mrs. Hart.
1 Fresh-water fish	*Wallago Attu*	H. H. Swan C.E.
A quantity of fish and scorpions from Suakim.	.....	H. Wenden, C.E.
Megapodius Nicobariensis and egg from Nicobar Islands.	.....	Do.
1 Alligator's skin	*Crocodilus porosus*	Mrs. Sleater.
A quantity of algæ	.....	Capt. Bishop.
Corallines and marine specimens from Persian Gulf.	.....	Do.
14 Fossil Echinidæ from Khavey Island.	.....	Do.
A quantity of iron pyrites from Larek Island.	.....	Do.
Specimen of sponge and coral from Suakim.	.....	Col. Walcott.
Fossil tooth of elephant from Runn of Cutch.	.....	H. A. Acworth, C.S.
Sucker fish	*Sp. Echeneis*.....	Do.
1 large Dhaman (alive)	*Ptyas mucosus*.....	Wm. Shipp. C. E.
Skin of white-bellied flying squirrel.	*Pteromys albiventer*	R. A. Sterndale.
Skin of yellow-cheeked Marten	*Martes flavigula*	Do.

Minor contributions from H. A. Acworth, C.S., Mrs. H. S. Symons, J. Parmenides, H. Buckland, Chas, Lowell, C. E. Crawley, W. W. Squire, Mrs. A. F.

Turner, Father Dreckmann, W. Gleadow, William Shipp, R. Wroughton, and Dr. E. M. Walton.

Contributions to the Library.—"Vegetable Materia Medica of Western India" (Dr. Dymock) from author; "Game Birds of India, Burmah and, Ceylon" (Hume Marshall); W. Sinclair, C.S.; "Moses and Geology" (Kinns) W. Sinclair, C.S.; "Wanderings of Plants and Animals" (Hehn), W. Sinclair, C.S.

Specimens deposited with the Society.—5 Cashmere stag heads, from Dr. Banks; 2 Himalayan Ibex heads, from Dr. Barks; 1 Ovis Ammon head, from Dr. Banks; 1 Markhor's head, from Dr. Banks; 1 Cheetal's head, from H. S. Wise; 2 Black Buck's heads, from H. S. Wise; 1 Hyena's head, 1 Wild Cat's head, 2 Neilghai heads, mounted by the Society's taxidermist for up-country correspondents, were also exhibited by Mr. E. L. Barton.

The Secretary announced that the second number of the journal, containing much interesting matter, was now ready for issue to subscribers. A vote of thanks was passed to Mr. Sterndale for having, in the absence of Mr. Aitken, undertaken the sole task of editorship and for bringing out the journal so punctually.

Mr. Sterndale exhibited, through the courtesy of Messrs. William Watson & Co., two cubs of the Indian Sloth Bear (*Ursus labiatus,*) the property of Mr. Mainwaring, and now on their way to the London Zoological Gardens. One of these cubs is the Albino referred to in the second number of the Society's Journal. The cubs were taken out singly and petted by some of the members present, who were much amused at the petulant cry, like that of an infant, which the little bears made when separated.

The living Flying Squirrel presented by General J. Watson, V.C., was also exhibited, and appeared to be none the worse for its flight across Rampart Row, recently alluded to and described in the Journal.

Mr. Sterndale also exhibited a very tame specimen of the Mongoose Lemur (*Lemur mongos*) from Madagascar.

Mr. Phipson turned loose one of the two Kangaroo rats (*Hypsiprymnus rufescens*) lately received from Mr. G. F. Johnson, of the P. and O. Company, Adelaide. The little animal, which is about as big as a rabbit, went bounding round the rooms and caused much amusement to those present.

Dr. Maconachie showed, under the microscope, a sample of the Tulsi drinking-water, collected an hour or two before the meeting. Among masses of vegetable matter there were crustaceans, worms, infusoria, animalcula, and other animal specimens, living, dead, and in various stages of decay.

THE usual Monthly Meeting of the Society was held on Monday, May 3, at 6 Apollo Street, and was largely attended. The Hon. Mr. Justice Birdwood, Vice-President, took the chair. The following new Members were elected; His Highness the Rao of Cutch, Colonel F. G. Wise, Mr. C. L. Weber, Mr. R. N. Mant, Mr. G. P. Millett, Mr. James Tod, Mr. R. Riddell, R.E., Mr. Robert Clark, Mr. James Cheetham, Mr. T. R. Booth, Dr. D. G. Dalgado, Rev. H. P. Le Febvre, Mrs. Charles Douglas, Mr. P. C. Oswald, Rev. J. Forgan, Mr. Thomas

Bromley, Mrs. Dillon, Mr. T. W. Pearson, Mr. R. H. Macaulay, Mr. Andrew Hay, Dr. Bhiccajee Eduljee Gaswalla, Mr. C. E. Fox, Mr. Montagu C. Turner, and Mr. A. E. Hoare.

Mr. H. M. Phipson then acknowledged the following contributions to the Society's collections during the past month :—

Contribution.	Description.	Contributor
A Golden Pheasant alive from China	.....	Mr. E. D. Barton.
A number of Snakes and Lizards from Saugor	.....	Lieut Barnes.
Snout of Saw-fish	*Pristis anteguorum*	Miss R. Rich.
2 skins of Flying Squirrels	*Pteromys oral*	Mr. E. C. K. Ollivant.
A number of Snakes and Reptiles from Deolali.....	.....	Mr. F. C. Webb.
Head of large Saw-fish	.....	Mr. D E. Aitken.
1 Porcupine alive	*Hystrix leucura*	Mr. A. S Ritchie.
Head of Sind Ibex	*Capra ægagrus*.....	Mr. B. T. Ffinch.
Head of Bison.....	*Gavœus gaurus*	Mr. Robt Clark.
3 Snakes	*Echis Carinata, Dipsas Gokool*	Mr. F. D. Campbell, C E.

Minor contributions from Mr. H. F. Hatch, Dr. Kirtikar, Mr. E. H. Aitken, Mr. J. W. Evans, and Mr. Nanabhoy Rachanath.

Contributions to the Library.—A series of photographs of animals shot, by Mr J. D. Inverarity. A paper on a new Gerbillus (by Mr. James Murray) from the author. A paper on a new species of Mus (Mr. James Murray) from the author.

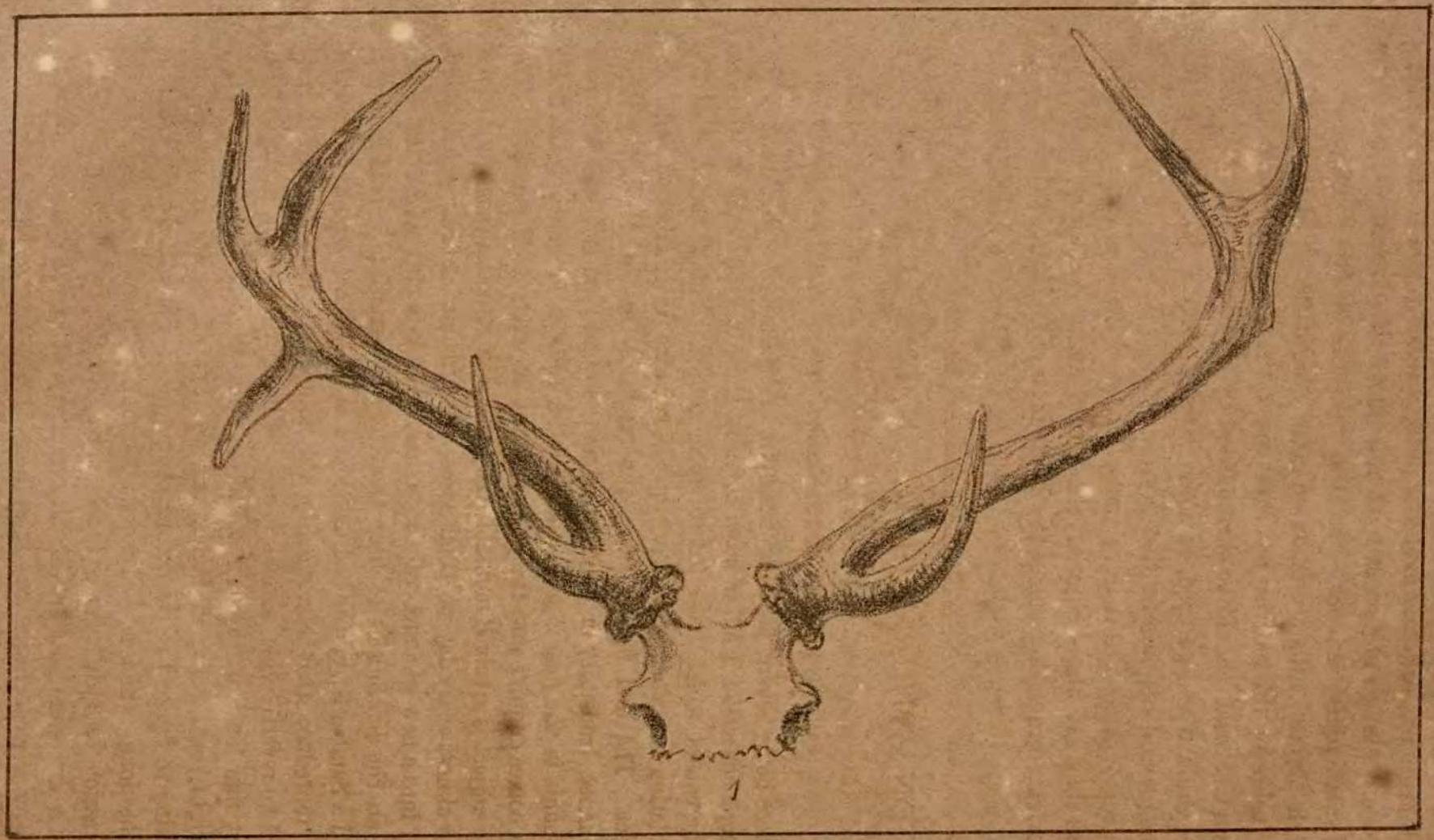
Mr. Phipson also announced that he had received a telegram from H. H. the Maharaja Sahib of Indore, offering the Society two panthers, which had, however, not yet arrived.

A vote of thanks was then passed to the ladies and gentlemen who had sent the following exhibits to the meeting :—

Exhibit.	Description.	Exhibitor.
1 Orchid	*Phaleonopsis grandiflora* ...	Mr. M. C. Turner.
1 Do.	*Saccolobium guttatum*	Mrs. Chas. Douglas.
1 Do.	*Dendrobium pierardi*	Mr. M. H. Starling.
3 Do.	*Æerides crispum*	Mr. E. H. Aitken.
2 Do.	*Dendrobium nobile*.....	Victoria Gardens.
1 Do.	*Adiantum peruvianum*	Captain Passy.
1 Fern	*Adiantum concinnium*	Mr. M. H. Starling.
1 Do.	*Adiantum fergusonii*	Do.
1 Do.		Do.
A quantity of new rare plants	.....	Mr. T. Bromley.

Mrs. Charles Douglas, Mr. G. W. Terry, and Mr. R. A. Sterndale showed some beautiful drawings of plants. Mr. E. L. Barton exhibited a carpet made from a tiger's skin and twenty-two black buck skins, and also a large specimen of Rock Snake (*Python molurus*) stuffed and mounted by himself.

Mr. Starling drew attention to a fern (*Adiantum fergusonii*) exhibited by him, and explained that it had been found about five years ago in a garden at Negombo in Ceylon, but that no one knew how or whence it had come there. The species was unknown at Kew, but the authorities there considered that it was a cross between *A. farleyense* and *A. tenerum*. Looking, however, to the place where it was found, that was impossible, as *A. farleyense* had never been known to bear spores in Ceylon. It was, therefore, regarded by Dr. Trimen, the Director of the Botanic Gardens at Peradeniya, as a new species, and named by him after the discoverer, Mr. Ferguson, the Municipal Engineer in Colombo. Mr. Starling also suggested that it would be useful if those who had plants of *A. farleyense* would watch them, as his had apparently prepared to bear spores, the edges of the leaves having turned under, to as to form receptacles, but that he had not hitherto been able to detect any spores.



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R. A. Sterndale. Del.

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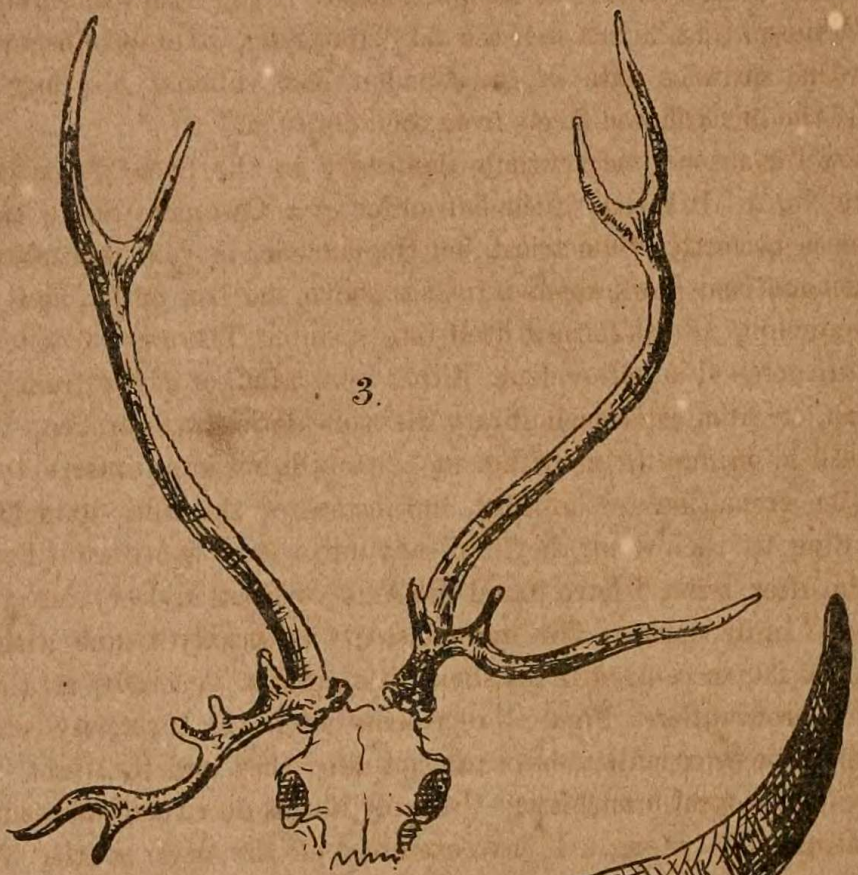
R. A. Sterndale, Del.



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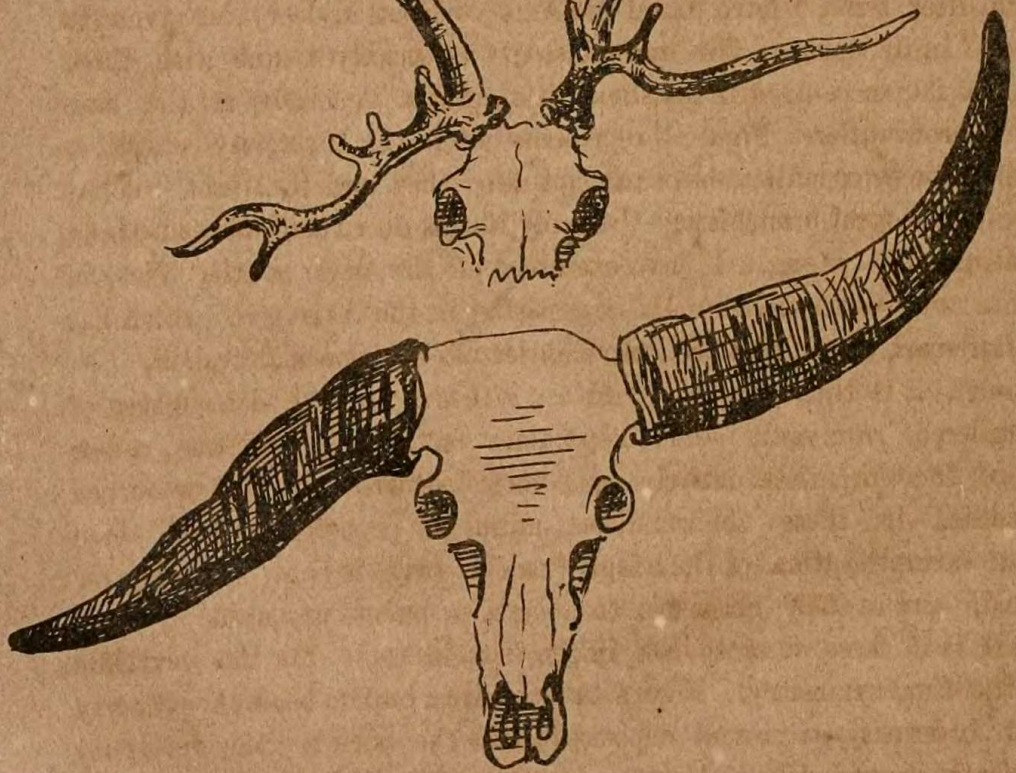

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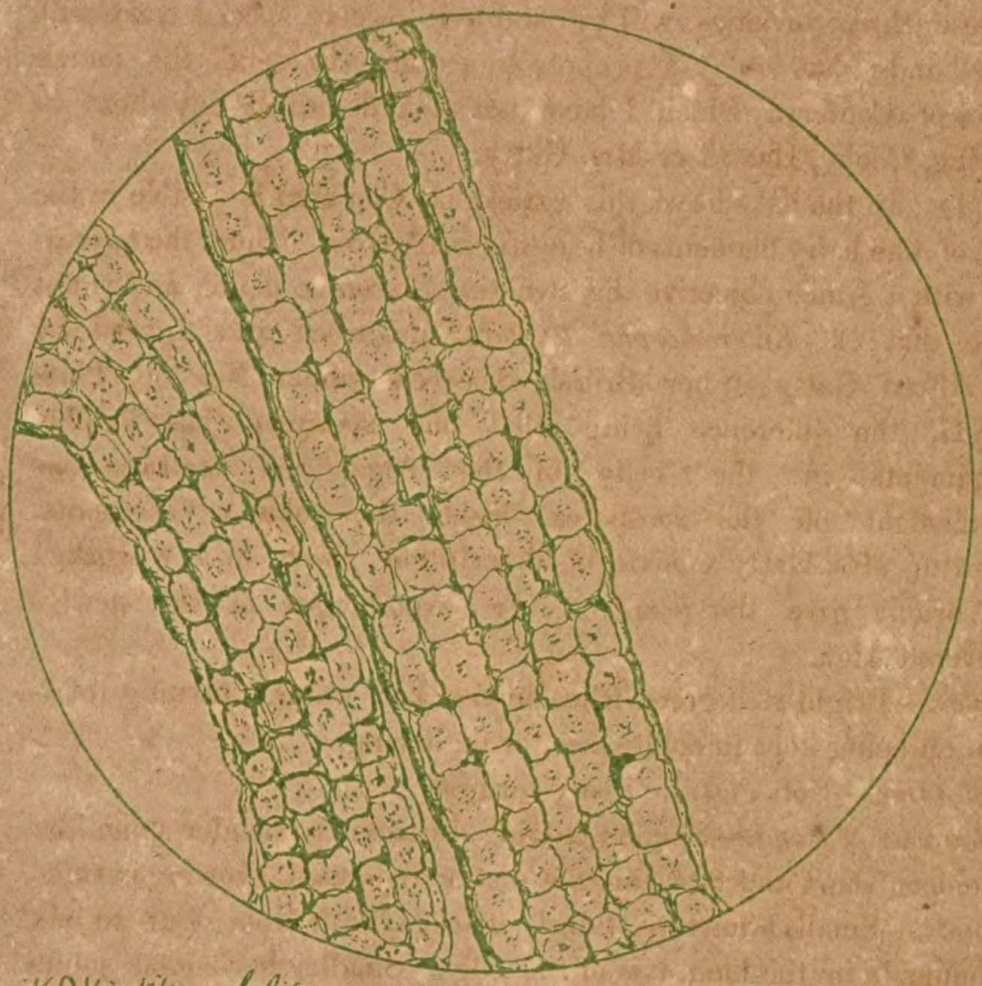
R.A Sterndale. Del.

KIRTIKAR's
CONFERVA THERMALIS BIRDWOODII



K.R. Kirtikar delet.
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× 400. From a photo

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